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PREFACE.

The following study pretends to be no more than a contribution toward an eventual formulation of the Philosophy of Roger Bacon. It is neither a literary nor an historical study, but rather a critical presentation of certain aspects of his Philosophy.

The time has hardly come when one can undertake seriously to write of the Philosophy of Roger Bacon. Such a work presupposes materials in a very different form from that in which we have them. Further, there is presupposed a study of our Author's sources, with the purpose of making clear the influence of his predecessors in the shaping of his thought. And, finally, a better account of the life of Bacon is desirable, to indicate the influence of his contemporaries upon his philosophical and scientific activities.

It was my hope at the outset to be able to make this a literary and historical, as well as a critical study, and founded upon a preliminary examination of my Author's *works* and *sources* and *life;* but with the realization of the requirements involved, this hope quickly faded. It is possible therefore merely to indicate where the life and works and sources, so far as discussed, may be found.

For the fullest discussion of these subjects, the reader is referred to EMILE CHARLES' Monograph, "Roger Bacon, sa vie, ses ouvrages, ses doctrines, d'apres des textes inedits," published in Paris, 1861. Bacon's life is treated pp. 1 to 53, and some further suggestions as to his personality 97 to 110, and 306 to 310; his works pp. 54 to 96, cf. 334 to 416; and for an admirable attempt to indicate his sources, see pp. 311 to 322 (also 97 to 288, passim). Charles' work has not been superseded; nor, as such, is it likely to be. At once its advantage and its disadvantage lie in it its broad scope and its fairly free play of the imagination. It should be added that Charles does not confine himself to the unedited works (suggested by the title), and that his citation of sources is inadequate.

In J. S. BREWER's "Fr. Rogeri Bacon Opera quaedam hactenus inedita," London, 1859, is to be found (Introd. pp. lxxxv. to xcix.) an account of Bacon's life (English translation from Wood's "Hist. et Antiq. Univ. Oxon.," Oxford, 1674, pp. 136ff); and in the same Introduction (pp. xxviii. to lxxxiv., cf. c.) a scholarly discussion of Bacon's works, especially of value for orientation in his general literary activity and philosophy.

In JOHN HENRY BRIDGES' (deceased, 1907) edition of "The Opus Majus of Roger Bacon," Oxford, vols. I and II 1897, vol. III 1900, will be found a table of the few *known* facts of Bacon's life (Introd. p. xx.), and a short description of that life (ibid. xxi. to xxxiii.); but he gives little that is new concerning the works of our Author. He gives, however, a very serviceable orientation in Bacon's general philosophical scheme (ibid. xxxvi. to xcii.). In "Essays and Addresses," by the same Author, posthumously published, London, 1897, will be found (pp. 159 to 168) an interesting sketch of our Philosopher's life and work. As for sources, much material of great value is to be found in the footnotes of his edition of the Opus Majus.

In ROBERT STEELE'S edition of the "Metaphysica Fratris Rogeri," London, Alex. Moring Limited, is given (Preface) some further material, especially concerning the Metaphysics (sic) of Bacon. The same Editor has published Parts One and Two of the "Liber Primus Communium Naturalium Fratris Rogeri," Oxford, Clarendon Press.

In "The Greek Grammar of Roger Bacon," edited by Nolan and Hirsch, Cambridge, 1902, some material is presented that bears on the life, with especial reference to his contemporaries (Introd. xxxviii. to lxv.).

For bibliographies, the reader is referred to Delorme's art. in "Dictionnaire de Theologie catholique," t. II, ff. 8 to 31; and to Robertson's art. in the "Dictionary of National Biography," vol. II, pp. 374 to 378, ed. 1885, as well as Vogl: D. Physik Roger Bacons, Inaug. Diss., Erlangen, 1906.

The *materials* on which this study is chiefly based are the published works of Bacon as contained in the Brewer and Bridges editions above described; the latter contains the Opus Majus and the De Multiplicatione Specierum, while the former contains the Opus Tertium, Opus Minus, Compendium and the appended De Secretibus Artis et Naturae. Further, I have referred, here and there, to the editions of Steele above described, and to the printed (English Historical Review, July 1897) MS. (4086) found by Gasquet in the Vatican Library. In no case have I used any but published material. My references to the various works are as follows: Brewer, "Br...."; Bridges, "I, or II, or III...."; Steele, "M...." for the Metaphysics, and "C. N....." for the Communia Naturalium; Gasquet, "Ep...." for the self-denominated "epistola praeambulans." I have taken these sources at their face value, as representing words actually penned by my Author; in no instance have I found serious difficulties of text so far as concerned my theme. The corrections of text, as in Bridges III, are not vital; the addi-

tions to the text, for Pars Prima, are however of real value. While vol. III (Bridges) suggests that it is not complete (see pp. 177 and 179, "preface to this volume"), I am informed that the late editor left no further materials.

The *method* followed has been simple, but it has been sought to make it painstaking. Certain definite questions were put to my Author, and the answers sought in his own words; attention has been confined to a critical examination of his own works, and the literature on Bacon has been little taken into account. The method of collation of parallel passages has been employed to the utmost possible limit. Accordingly, as an instrument for automatic control, an Index Rerum was composed, comprising something over two hundred concepts, and containing upward of seven thousand references. With this my Author's treatment-in-chief was compared with all other relevant passages, to establish consistency or reveal inconsistency of conception. Where the latter appeared, it was sought to indicate a reconciliation, if possible, and that failing to seek the cause or the motive for the inconsistency. Pains have been taken throughout to say nothing which cannot be established by definite citation. And, further, it has been taken to be of essential importance not only to answer a given question clearly, but just as clearly to indicate my failure to do so.

The *limitations* of my work are expressed in the title selected, which it will be observed is fairly broad. Under Theory of Mind is included Psychology and Epistemology; under Psychology, both the physiological and the analytical; under Epistemology, both Theory of Perception and Theory of Knowledge, with the implied Criteriology. In Chapters II and III is to be found Bacon's Psychology; thus, the distinction between vegetative, sensitive and rational souls, their origins, their relations to each other, and the faculties and physiological basis of the sensitive soul, on the one hand: and an examination of the rational soul in and for itself, with reference to form and matter, and in relation to its sources of knowledge, with reference to the "intellectus agens" problem, on the other hand. In Chapter IV is to be found our Philosopher's Epistemology and Criteriology; thus, first his notion of the Perception of the External World, where the process of Perception, its analysis into Sensation, Association—and here his notion of the Universal—and Inference, and true as opposed to erroneous Perception, are considered: then, second, his notion of the part played by the Understanding in the winning of our Knowledge, where his conception of Proof in general and in particular is examined, to make clear how far a Criterion is given. Chapter I contains, as a necessary introduction, a critical presentation of his Theory of Species,

which colors the whole background of his Theory of Mind in particular, and his Philosophy in general.

A word should be added concerning the general character of Bacon's work. Although premature, it would not seem hazardous to assume that his work retained to the end of his days much more the character of outline than of system. The frequent repetitions, the extraordinarily wide scope of his reading, his marked gift of criticism and less marked capacity for synthesis, his intense enthusiasm and lack of judicial calm, on the one hand; and the purely external circumstances that filled his literary career with embarrassments and difficulties, and especially the imprisonment that robbed him of many of his best years, on the other hand — all make for a very reasonable presumption that his chief contribution in the history of thought was to be less a systematic Philosophy than a Method of procedure. For an excellent picture of the difficult circumstances that surrounded the composition of the Opus Majus, Opus Minus and Opus Tertium, attention is especially called to Brewer's Introduction (pp. xvi. ff). It is well to keep this picture clearly before one's mind in the study of Bacon; for it frequently makes plain what would otherwise be puzzling.

INTRODUCTION.

In following the history of thought one comes soon to know those figures in the drama who pass as the men "beyond their time"; men whose minds are so endowed as to assimilate fairly well the learning inherited by their time, but especially gifted with an insight that carries them beyond their immediate age. It is with a mind of this type — a mind too far beyond its time — that we shall have to do in the pages that follow. For, that which is characteristic and original in Roger Bacon is not the system of his Philosophy, but rather his search for philosophic Method; and indeed a search in which appears an anticipation, now clear and again but vaguely suggested, of the trend of thought which in later centuries came to be called the Scientific Movement. His is not a mind that fits comfortably into the predominant tendencies of the thirteenth century, and it is therefore important that we should bear in mind throughout the type of mind with which we have to deal.

Living (1214–1294)[1] in a century when the most varied determining factors were at work, his natural bent threw him into that development which might properly be called the Scientific Movement of his day.[2] Dissatisfied with what seemed to him the unfruitful method of inquiry then prevailing, he bent his efforts rather to preliminary Method than to formulated System, to the foundations of knowledge rather than to the completed edifice. The world, he thought, was quite too full of vain attempts to systematize; overburdened with specimens of plebeian and trivial knowledge. "It is easy," as he says,[3] "for any man of learning to multiply without end truths that are paltry and commonplace, and to spin out and magnify what is of little value. But for the scholar this is an unworthy procedure, and the more so when the limits to his scholarly thought are fixed thereby." And more than once he gives evidence of an intense disdain for the learning of the eminent scholars of his day.[4] But his impatient dismissal of that learning

1 Exact dates are not known. As late as 1220 is not impossible for birth (v. Br. 65), and he must have been living in 1292 (v. Br. Pref. lv., n. 2). Cf. Emile Charles, op. cit. pp. 4—6; 41, n. 2; 109, n. 4.

2 See C. Baeumker: Die Europ. Philos. d. Mittelalt., in Kultur d. Gegenwart, T. I, abth. V, pp. 327—331, Berlin 1909. Also M. de Wulf: Histoire de la Philos. med., secs. 116—119, prem. ed. Paris 1905. The Baeumker-v. Hertling Series has served to make this plain. For indications in Bacon's own works of the "scientific" movement under way, see e. g. I—116, cf. II—538 (cf. 134); Ep. 511; C. N. 9; Br. 43, 47, 113, 116, 317; II—202; Br. 359; 523—551, especially 533; 34; 41; 58, cf. 38; III; 33, 43.14, 70, 91, 329, 428, 469, 472; 434; 94.

3 See Ep. 501.

4 Thus, Br. 30ff.; 325ff.; C. N. 11ff. Cf. Br. Pref. lvi. The Compendium Studii Theologiae is promised, ed. H. Rashdall, for publication by the British Society of Franciscan Studies.

is from no unworthy motive;[5] it arises rather from a pure and whole-hearted love of Truth — indeed, the man is carried away with the fine enthusiasm of the devotee of Truth "writ large." "I am after the treasures of the Sciences," he continues,[6] "the wonders of Truth whereof one excels a thousand of commonplace truths. I would diligently search out the dominion of the Sciences and of the Languages, and the other things needful to raise the edifice of Truth." Bold words these are, but they well characterize the spirit and the labor of the man as we know it. And so it is not strange that the figure of Bacon has been drawn almost exclusively in these lines by the historians of Philosophy.[7]

But while his mind was so full of this inquiry after method, one does wrong to suppose that it held nothing more; nothing more than a critical opposition to the conditions then prevailing in the scholarly world, and an attempt to sketch some plan for its regeneration. On the contrary, his works make it plain that he had pondered — and pondered deeply, shrewdly and seriously — the problems that engaged the thoughtful men about him; and that he had his own views, and very decided ones they were, concerning these problems. To be sure, that degree of system which characterizes the work of Thomas Aquinas we are not to expect; for only in Bacon's *Scriptum Principale* could this have been furnished, and that great work, if ever consummated, does not exist for us now.[8] But there is plain evidence of a system in the making, and it is our task to indicate some of its features, and to make clear his position with reference to certain of the problems which attracted the thinkers of his day.

Now in his work there is revealed a mind filled, out of all proportion to his time, with the conviction that the exactness of the mathematico-mechanical method alone could be fruitful in investigating the various departments of knowledge. And while there are

5 See Ep. 503, cf. Br. 59, 42, 29ff.

6 Cf. Ep. 501 with 498.

7 Bacon stands pre-eminently for the restoration of learning, hence method is his first interest (Br. 60, cf. II—201), and conditions any systematic formulation (Ep. 501). The edifice to be raised he sketches in broad outline. Languages are the gateway to the wisdom of the past (Ep. 516); Mathematics is the foundation (I—103ff., cf. Br. 104ff.), as well as the gateway *and key* (I—97) of all the other Sciences. A universal hypothesis is found in his theory of Species (v. inf.). The field for urgent investigation, that of "Experimental Science" (II—167ff.). And the end of it all is Moral Philosophy and the regeneration of the world through the Church (Ep. 510, cf. 503; I—61, cf. 56. Not to be misunderstood; his conception is so broad as to be similar to that of the Positivists). But a project so grand required the assistance of a patron (Ep. 504, cf. I—300, 400) for its complete execution; and his Opus Majus, with its auxiliaries, the Opus Minus and Opus Tertium, pretended to be only a preamble (Ep. 498, 503, 507; II—298, 159; I—127; Br. 120). He was ready to produce the finished work under the proper conditions (Ep. 500, 501, cf. Br. 65), which he thought of as a Scriptum Principale.

8 It is not probable that this projected work was ever actually completed. For its character see I—Introd. xliii. ff. Bacon often refers to it. Thus, e. g., Ep. 509; I—72, 305, 403; II—219, 377; Br. 56, 306; C. N. 10, 13, 105.

many indications [9] of this scientific character of our Author's way of thinking, these lie for us too far afield.[10] But there is one feature so salient, so vitally characteristic, and so important for his Philosophy of Mind, that we must devote our first efforts to a comprehensive study of it. And this is his theory of Species or Forms.

9 For example: (a) His impatience with the scholastic method ("more scholastico," Ep. 501), see above note 3. (b) His notion of Authority (e. g. I—3, 13ff., 15, 31; II—7, 12ff., 169). (c) The conception of a "Scientia Experimentalis" (II—167ff). (d) His expenditures for scientific work (Br. 59, cf. 65, 56). (e) Scientific spirit toward the writing of Geography (I—298ff., cf. 304, 338, 350, Br. 403). (h) His distinction between Astrology and Astronomy (I—238ff; Br. 268ff). (g) His insistence upon acquaintance with original sources, for biblical exegesis and for knowledge of Philosophy (I—66ff.; Br. 88ff., 330ff.).

10 Bacon's conception of Law in the Universe is probably the most striking indication of his "scientific" *penchant*. His mind is firmly possessed with the thoroughgoing prevalence of Law, saving that his Universe remains one conserved by God and always subject to change by Him, and one in which man's soul is the object of central value. The reader who is interested may consult the following references: I—33, Br. 73, II—366, 385 (the unity of the University). II—503, 453, cf. 455 and 197 (Order). I—212, 214, 175, 43; I—216, 212; II—457 (teleological and mathematical conception). Br. 154; II—495, cf. 417, 436 (co-ordination of parts). II—215, cf. I—144, 127 (mechanical). I—122; 130; II—476; I—158; I—142; II—508 (special "laws"). I—137; II—37, 49 (laws of the propagation of Species. Cf. Aristotle, De Gen. et Corr., I—3, 318a, who fails to raise the generalization to the level of a law; cf. Baeumker, Prob. d. Mat. etc. 235, n. 3, and Zeller, D. Philos. d. Griech. 3te A., II—b, 391, n. 4). II—167-223 (the new field of Exp. Science, presupposes law throughout; for "autonomatice" cf. II—223, Ep. 510. Exp. Sc. and *Mathematics* and *Optics* are three of the four "Scientiae magnae," v. II—222, cf. I—97; it proceeds by way of induction, v. II—173ff., cf. 201ff.). I—249ff. (attempt to put Astrology on an exact basis).

Chapter One.

THE THEORY OF SPECIES.

The Theory of Species or Forms [1] is an attempt to explain the phenomena of qualitative change in the world, and indeed in the whole universe—the Aristotelian universe of the Mediaeval thinker. Our Author sets out from Aristotle's conception of assimilation, and pretends to make a distinct advance upon that conception.[2] The problem is not, therefore, a problem in Logic, with Species as opposed to Genus for the central concept; [3] but a problem in Natural Philosophy,[4] where Species in the sense of Form or Image or Likeness is the central theme. In the action of one thing upon another, it is that "immediate or first effect of the Agent" which is propagated in the medium and works the secondary effects; such, for example, is the "virtue" of the sun in the air which acts upon wax and melts it, upon clay and hardens it, upon the sense of touch and produces the feeling of warmth.[5]

Of the many words used to express this idea, Bacon furnishes us with a list.[6] Thus, with reference to the process of physical change, the term Virtue is employed, because the Agent is conceived as putting its "virtue" into the thing acted upon. In Optics the term used is Form; and in particular, the reflections in mirrors are called Unsubstantial Forms. And for perception and conception there are various terms in use, such as Species and Impression and Intention and Phantasm, or Simulacrum, and Affection. Species and Impression are used, following the terminology of Aristotle. Intention serves to indicate its unclearness in contrast with the real thing whose likeness it is. As applied to dreams Phantasm and Simulacrum are used, because the Species is taken for the reality which it resembles. And it is called Affection because the medium and the senses are affected and substantially changed by receiving the Species.

1 For Bacon's special treatise on the Propagation of Species see II—407--552. Cf. I—110--174; II—130--159; Br. 110—117; Ep. 512, 513; C. N. 14—49. The significance of this theory for his theory of perception is appreciated by Emile Charles, v. op. cit. pp. 226—240. Its significance for Physics is treated, briefly and inadequately, by Sebastian Vogl: Die Physik Roger Bacons, Inaug. Diss., Erlangen 1906.

2 See C. N. 5ff.

3 See II—409.

4 Which of course includes Psychology. See II—422, cf. 12, C. N. 8. This division follows Aristotle; see Zeller, ibid. 384ff., especially 386, n. 5, and cf. Aristotle De An. 403a.

5 See Ep. 512, cf. II—409, 417.

6 See II—409ff.

With Species so described, the importance of this theory for his Philosophy of Mind becomes apparent at once. And, indeed, Bacon directly calls attention to the vital importance of his treatise, on the Propagation of Species, for the understanding of his theory of Perception; the latter cannot be understood at all without the former.[7] And conversely the action of the mind upon the body is explained by use of the same theory.[8] In fact, all phenomena of qualitative change in the one world (spiritualia) as in the other (corporalia), and in their interaction, are to be brought within the scope of this single, far-reaching hypothesis.[9] There is apparently no realm left untouched [10] by the " laws of the propagation of Species, which the sense of sight follows in common with all other senses, and with the whole machine of the universe." [11] And as one turns the pages whereon lie registered the hopes and expectations of our Author for this theory of his, he knows not which to admire the more, the genius that could give meaning to his thought, or the courage that could face its full execution. Certain it is, in any case, that it forms " the warp and the woof " for his Philosophy of Mind.

1. THE SETTING OF THE THEORY.

It has already been indicated, that Bacon's theory of Species is an attempt to explain change of a certain kind; not change in position, nor change in quantity, but change in quality.[1] This fur-

7 See II—40, cf. Br. 321 and Ep. 511. Also Br. 36; II—3; Br. 114; II—425. For Aristotle the notion of assimilation is of similar importance for sense-perception; see De An. II, ch. V, init.

8 E. g. I—396ff.

9 See III—184ff. ". . . primo . . . in corporalibus agentibus et patientibus, secundo in spiritualibus ad invicem et respectu corporalium. In corporalibus vero etc. . . . Et capitulo X ut tangit spirituales substantiales." The "cap. X" is wanting. This preamble is from a MS. in the British Museum (Add. MSS. No. 8786). It is apparently referred to in the De Mult. Spec. ("prologus istius operis," 513). Emile Charles saw it (op. cit. 231), and Brewer quotes in part from it (Br. lii. ff.). It is an occasion for keen regret that the "cap. X" is wanting. Did he actually write it? Charles conjectures not. But certain considerations must not be overlooked. He intended the theory to apply to mental as well as physical phenomena (I—111, "tam spirituales quam corporales"). In the Opus Majus he treats of just such phenomena and in such wise as to presuppose a fuller treatment elsewhere (I—216ff., 398ff.; II—159ff.). In the Opus Tertium, written after the De Mult. Spec. had been sent to the Pope, he makes a direct application of the theory to the problem of the Intellectus Agens (Br. 76ff.). In the De Mult. Spec. direct reference is made to this "cap. X" (II—417, 457). And the MS. of this treatise breaks off abruptly (p. 551); what follows ("Videlicet" etc.) to the end is repetition of pp. 414, 415. It seems most likely that the copyist simply failed to copy further; and that this repetition is a marginal note (cf. III—187, for 544 and 551).

For the reciprocal action cf. above note. Perception is only a special case. The Species is the same whether it acts upon the senses or the understanding or matter, see II—417, cf. I—111. Emile Charles sees this, op. cit. 231.

10 Thus, God's propagation of the Species or Forms which He brought into being by creation (I—III cf. C. N. 22, Ep. 512); the Angels' control of the movements of the celestial bodies (I—III cf. 120), and the mutual influence of these bodies upon each other (I—130); the generation, by the sun and stars, of all terrestrial life (I—120, cf. 378); the generation of the sensitive soul (v. inf. ch. II); the rational soul's control of its body (I—402ff.); the perception of the external world (v. sup. cf. inf. ch. III); the same soul's influence upon persons and things (I—142, 143, here also his striking application to health and disease, cf. 398ff., II—401ff.); the influence upon both soul and body from the celestial bodies (I—138, 139, 249ff., 376ff.); the body's infection of other bodies (I—398ff., cf. II—143ff.); and the propagation of light, as the type of all propagation (II—458ff., cf. I—216. He speaks of the treatise as "De Radiis," Br. 227, 230). See further I—127ff.; Br. 37, 38, 75ff., 99, 107, 117, 321; C. N. 16ff.

11 See Br. 37 cf. 117.

1 With Aristotle, the attempt is distinctly to supersede the mechanical with a theory

nishes broadly the limitations of his problem. And it is this problem, set by his master [2] Aristotle, which he means to further develop.[3] Let us get succinctly before us, therefore, the Aristotelian treatment of the problem, to see how far he carried it, and wherein it offered opportunity for further development.

The problem of change forms for Aristotle one of the three great problems of his Metaphysics, and the leading theme of his Physics.[4] And he was the first to treat it fully with reference to Matter and Form.[5] Change is motion,[6] and motion is the transition from the Potential to the Actual; it therefore implies the actual Form and the potential Matter.[7]

In his analysis of Motion [8] he finds three kinds, to wit, spatial and quantitative and qualitative. There are several kinds of change in position.[9] Change in quantity is either increase or diminution; while change in quality is alteration. Generation and decay may be added as a fourth kind of change. In a sense all change may be reduced to change in position; yet change in quality is to be counted as a second source.[10] The conditions for the process of change are as follows: contact between Agent and Patient, identity of Genus, and difference of Species. When Agent and Patient meet, the one is actually what the other is only potentially; and the change consists in the removal of the opposition, that is, the Agent makes the Patient like itself.[11]

A careful examination of the Aristotelian conception reveals, that in three important respects it permitted further elaboration. First, in the circumscribing of the problem — the relation of change and motion, and of the various kinds to each other. Second, in the meaning and function of Form and Matter. Third, in the details of the process of assimilation. As regards the first, Bacon shows

of qualitative change; see Zeller, ibid. 392ff., c. 417. Bacon concerns himself little with movement in space, as such; but his opposition to the atomic theory is obvious, see I—151ff., cf. Br. 131ff.

2 See, e. g., I—4, 8, 10, 27, 390, 392.

3 Cf. sup. He sets out from efficient and material cause, see II—411ff., cf. 52, 37, I—110, Br. 107ff, C. N. 14ff., Ep. 512ff.

4 See Zeller, ibid. 303ff., 278ff., 393.

5 The dualism between Matter and Form was first suggested by the Pythagoreans, and the conception was taken by Plato. But Aristotle, while accepting its essential outlines, develops it fully. See Baeumker: Prob. d. Mat. p. 45.

6 On this Arist. is not consistent, but on the whole the two terms are interchangeable. See Zeller, ibid. 352, n. 3, cf. inf. n. 8.

7 See Zeller, ibid. 351ff.

8 See Zeller, ibid. 389ff. cf. Baeumker, op. cit. 226ff. Arist. wavers in his enumeration of the kinds of change. The strict classification would be as follows: The highest general concept is Change, of which there are three kinds, namely, (a) from non-Being into Being, (b) from Being into non-Being, and (c) from Being into Being. (a) and (b) are generation and decay respectively. (c) is in turn, of three kinds, namely, spatial, quantitative (increase and diminution), and qualitative (alteration). Only (c) would be motion in the strict sense. (a) and (b) taken absolutely, are impossible; taken broadly they may be treated as kinds of Motion or Change. Or, the latter may be regarded as change in substance; the former as change in accidents. See Zeller, ibid. 391, cf. Baeumker, op. cit. 214, 227, 257ff.

9 See Zeller, ibid. 405, 435, cf. 389, n. 2.

10 See Zeller, ibid. 393, 417. The reducing of all to change in position is contrary to the spirit of his Philosophy, hence this addition.

11 See Zeller, ibid. 418ff. cf. 351ff.

the same uncertainty as Aristotle. But all the more do we find his efforts directed toward clarifying the second and third. The vantage ground from which he makes his further development is that of Optics;[12] an advantage which he owes especially to Ptolemy and Alhazen.[13] We shall later see how this element is combined with the Aristotelian conception. Let us now see how closely Bacon follows Aristotle for the general setting of his theory.

His point of departure [14] is along the same broad lines as Aristotle's. After Matter and Form and Privation, he says, the natural Philosopher [15] has two fundamental factors to investigate; these are motion with respect to Place, and motion with respect to Form. It is the latter rather than the former [16] in which he is interested; for it has to do with qualitative change, and includes alteration, generation-dissolution, and increase-diminution. Now while the last of these three is usually involved in the first two,[17] yet strictly this sort of change is not effected through the Species, which never adds to the quantity.[18] His theory is therefore really directed to alteration and generation-dissolution. For alteration has to do, not with quantity as such, but with the Form that is to be designed or released in this quantity.[19] And alteration is of two kinds, complete and incomplete.[20] In the one case, we have an entire transformation whereby the very nature of the Patient is replaced; loosely speaking, there is a certain generation of species here. And in the other case we have the kind of alteration (of the senses, for example, and the rest) which is effected through the Species; this is the sense in which he means to use the word. With this, it will be observed, is given the distinction between generation-dissolution and alteration, in the Aristotelian sense of change in substance and change in accidents. Bacon suggests that his theory is meant to be applied only to the latter, but he is obviously uncertain; and in point of fact he abides by no hard and fast distinction.[21]

12 Called Optics or "Aspects" (II—412 cf. 409), and "Aspects" or "Perspectiva" (II—50 cf. Ep. 511).

13 For the intimate relation between Optics and theory of Species, cf. sup. For his authorities v., e. g., II—1, n. 2, 3ff. cf. III—184, II—49ff., 513, 520.

14 See III—183.

15 Cf. sup. concerning "Natural Philosophy."

16 He mentions only direct and circular motion, omitting the spiral of Aristotle. He seems to reduce all to rarefaction and condensation (II—517ff. cf. Arist. Phys. VIII—7, 260 b. 1ff.), but shows no consistent conception (thus, cf. II—57, 450, Br. 181, I—168, Br. 230, 164).

17 See I—103 cf. Arist. De Coelo I—3, 270a, 13—35, and 1—5; Phys. VIII—7, 260b, 1ff. (Zeller, ibid. 437, n. 3, 390, 391).

18 See Br. 163. II—503.

19 See II—443.

20 See II—447 cf. 448, cf. Arist. De Coelo I—10.

21 His classification is thoroughly Aristotelian (see C. N. 2), but his use of terms indicates his uncertainty. Thus, "transmutatio" is used for complete change, or generation-decay (e. g. II—413, 422, 423, 455, I—129, Br. 161), but also as convertible with "alteratio" (e. g. II—439, 478, I—110, Br. 145). "Alteratio" is applied to the action of the Heavens where substantial change is produced (e. g. I—249, 379), and be it remembered the Heavens are the cause of all generation-decay (I—250, 287ff., 379ff., II—446ff.). Finally, Bacon's standard illustration of the process of assimilation is one that involves substantial change (II—414ff.).

As for Aristotle so too for Bacon the essential feature in the process is assimilation. The change is always for the production of a "like." The Agent assimilates the Patient to itself; the Patient is potentially that which the Agent actually is. For example, in the case of sense-perception, the sense of sight is assimilated to the quality to be perceived, and this is effected through the Species.[22] The details of this process, omitted by Aristotle, it is Bacon's intention to fill in. The conditions presupposed for the assimilation are the same for Bacon as for Aristotle, as we shall see.

We may now summarize. Within the general concept of motion, that which is formal as opposed to spatial, gives the field within which this theory of Species is to be applied. Within the formal, that change which is qualitative as opposed to quantitative engages his attention; and the qualitative is taken to include the change of generation-dissolution as well as that of alteration, though meant more particularly for the latter. Finally, the change is always such as makes for the assimilation of the Patient to the Agent.

2. THE PROCESS OF ASSIMILATION.

We may now get clearly before us our Author's description of the process of assimilation through the Species. As we should expect, his general description of the process begins always with the broad notion of Agent and Patient, or Efficient and Material Cause.[1] And the problem takes this form: How is any natural phenomenon brought into being? The answer in simple terms is this: When an Efficient Cause acts upon a Material Principle, the "virtue" of the former works the change in the latter — the Virtue of the Agent is infused into the Matter of the Patient, and transforms it until the Effect is produced. We have, then, three factors; the Efficient Cause or Agent, the Material Cause or Patient, and the Effect.[2]

As a first condition for this process it is necessary that the Agent and Patient should come together. And by this is meant, that they must exist not only simultaneously, but also in actual contact; the Agent must touch some part of the Patient, and through this contact work the change.[3] But while "approximation" is a necessary condition, none other than that described is required. It is a surface-contact, and that suffices. For, the Agent-as-a-whole is active, and changes the depths of the Patient part by part through the Species.[4] As a second condition, the Agent and Patient must belong

22 See II—411 cf. 31ff. For Arist. see C. Baeumker Des Arist. Lehre v. d. aeuss. u. inner. Sinnesverm. Lpz. 1877, pp. 11ff.

1 V. sup. Setting of Theory, init.

2 The materials for this description are taken from II—410ff., cf. I—110, Br. 107ff.

3 See I—110 cf. 434, 436, 441; especially 442.

4 See II—441, 442. Aristotle seems to treat the Patient as a whole, and to omit ref-

to opposite species of a common genus.[5] These two conditions are the only ones required.[6] Thus far Aristotle has been faithfully followed. But in the details of the actual process of assimilation, Bacon seeks to give what Aristotle omitted.

Bacon's preliminary description of this process is as follows.[7] We have before us, let us say, two objects each with a specific nature of its own; the one is Agent and the other is Patient, and the former is to transform the latter into a thing like itself. This transformation will be effected through the Species. Now, at first the Species is an incomplete effect of the Agent, and for that very reason is called just species; in fact, the only reason for the Species at all is its service in mediating the assimilation.[8] During this early stage of the process the Patient is in process of being assimilated to the Agent, but is retentive of its own specific nature. But there comes a time when the Agent, through its Species, has prevailed over the Patient; and this is the moment when the specific nature of the Patient has been destroyed, and the Agent has induced the complete Effect. And when this moment arrives, the effect of the Agent ceases to be called Species and is called by the name of the Agent itself.

To illustrate, by a very concrete case, Bacon takes the action of fire upon wood. At first the passive wood is called wood and the active fire called fire, *while the process is incomplete;* and that is while the process of assimilation is being carried on, through a certain something with incomeplete being, the Species. But there comes a point at which the fire has prevailed over the wood, and then the Species issues with a new name, fire. The Specific nature of wood has given way to that of fire, through the mediation of the Species; the first and incomplete effect of the fire issues then under the name of a complete effect, or fire. So fire produces fire through incomplete fire. In short, a complete Effect just like its cause is produced through the medium of the incomplete effect, or Species; and the Species is the kind of intermediary that can be identical first with the Agent and then with the supplanted Patient, or Complete Effect.

This is Bacon's preliminary account of the process. Its clearness in certain particulars makes only more annoying its confusion in other respects. The further study of details that follows will make the matter clearer. But, as we shall see, Bacon is here and

erence to the Agent. See Zeller ibid. 419. Bacon treats the Agent as a whole, and explains in detail the change in the Patient. v. infra.

5 Bacon omits to take up this condition systematically (however, see C. N. 15), but he thinks of it as equally important. See, e. g., II—422ff., 446ff., 518ff., 544ff. Br. 363ff.

6 See II—443. This is then in agreement with Aristotle.

7 See II—414ff. cf. C. N. 20. For Aristotle see Zeller ibid. 315ff.

8 See C. N. 20.

elsewhere guilty of serious ambiguity, for which his reader must be prepared.[9]

3. DESCRIPTION OF THE SPECIES.

We are now in a position to enter into a detailed study of the theory. And to this end we shall examine in order the following: first, the nature of the Species; second, its genesis; third, its limitations.

What then, precisely, is the Species? This question presses for an answer so soon as one touches his theory at any point. In and for itself it is nothing; it is described always by reference to something else. And from the very nature of his theory we should expect it to be so. He describes it chiefly by reference to the Agent, but briefly too by reference to the Patient and the Effect.[1] We shall follow the description in this order.

By Reference to the Agent — Everything, Bacon tells us,[2] has some essential nature, which must be either a definite substance or an accident. And such a nature is active (agens) because it is possessed of some particular virtue; that it has this virtue *means* that it can do something. Indeed, this operating virtue is only another name for the essence of the thing; from the standpoint, namely, of the operation itself.[3] Moreover, essence and nature and virtue are but different aspects of the same thing; and the same is true of substance, potentiality and force.[4] While each of the others refers to one or another aspect, virtue refers to the operation; that is, the potentiality in all Agents of calling out the action, as distinguished from that in the Patients of finishing this action.[5]

Now, Bacon frequently [6] uses Species as convertible with virtue. Is then the virtue just described the Species? It is not. There is yet a second sense of the word virtue, namely, the first effect of the virtue just described. This is the Species. And it is like the virtue, whose effect it is, both in essence and in action.[7] The Species, then, is not exactly the virtue or essence of a given Agent; but similar only to it. And yet it is as nearly like this virtue as it can be, short of absolute identity with it.[8] It is, as it were, a representative of the Agent, with full power to stand for its principal because of its likeness to it.[9]

9 The various ambiguities are taken up below, see "Critique."
1 What the Species is *not*, will be also gathered together below.
2 See II—412 cf. 432.
3 See II—408.
4 Ibid. The basis is Aristotelian, cf. Zeller, ibid. 386, (6). In the dispute, of his day, concerning the relation of essence and potentiality Bacon seems to have held consistently to the distinction here made. Cf. I—145, II—375.
5 Ibid.
6 E. g. I—111, 396, 398, 402; II—8, 35, 49, 52, 161, 434.
7 See II—409.
8 They differ only in respect to completeness, and in occupying different spaces. V. infra.
9 See II—409—"cui assimilatur et quod imitatur"—cf. 414, 419, 31. It is to be ob-

With this introduction, Bacon is ready to define the Species. But for purposes of exposition, let us get before us at once a summary definition, and then look closely into the meaning of its several parts.

THE SPECIES IS UNIFORMLY THE UNIVOCAL, INCOMPLETE, PRINCIPAL AND IMMEDIATE, OR FIRST, EFFECT OF THE AGENT.

It is *uniformly* so, in the sense that it is the effect [10] of a natural Agent acting in accordance with law and without variation. Always the first effect which the Agent produces is the Species; for, a natural Agent cannot now produce one "first effect" and again another.[11] To be sure, the same Cause, or Agent, does produce different Effects; but the difference is to be sought in the things acted upon, and not in the Agent. For example,[12] the sun illuminates the stars, melts the wax, hardens the clay, and warms the sense of touch; and it is the same "virtue" that acts upon all. But in each case the difference is in the Matter of the Patient receiving the Species; [13] the Species, as first effect, is always the same, quite regardless of the nature of the Patient.

The significance of this characteristic of the Species for sense-perception is important, and Bacon calls especial attention to it.[14] The Species of any given Agent is always Species-of-that-Agent; accordingly, whether it acts upon the external world or upon the senses, the Species as such is uniformly the same first effect.

It is the *univocal* effect of the Agent. An Agent may have many and various effects,[15] but all save the first are equivocal or secondary effects. These differ from the univocal or primary effect in various respects. Thus, of the former there may be many, whereas of the latter there can be but a single one.[16] Again, the univocal effect comes immediately from the Agent, whereas the equivocal effects are derived mediately through this.[17] Finally, the univocal effect is essentially the same with the Agent, whereas the equivocal effects are in essence unlike the Agent.[18] Still, the equivocal effects are predominant; they are the effects which Nature chiefly seeks.[19] And obviously, too. For, did the action of the Agent stop with

served, that all of the synonyms of Species have this same character of standing for or representing. We shall see that he uses species in a further sense, namely, part of the effect.

10 He does not hesitate to call it "effect." Thus, II—436, 545ff, Br. 108. But it is the first *effect*, and *immediately* produced.

11 See II—417.

12 See Ep. 512 cf. II—417ff., 52, Br. 109, C. N. 22.

13 For Bacon the current theory of the Unity of Matter is an "error infinitus"; Matter differs as much as Form. See I—143ff., cf. Br. 120ff., Ep. 513ff.

14 See II—417, cf. I—111.

15 See II—411 (cf. 409, 415, I—216), 414.

16 See II—413 ff., 415.

17 See below, "immediate effect."

18 See II—530, I—120, C. N. 16, 45, cf. III—4.

19 See II—530, cf. I—120.

this first effect produced, we should have the Species, to be sure, but nothing effected through them. And while the study of both is really the same, still the univocal effect must be understood first.[20]

As univocal effect, the Species is so like the Agent that it is all but numerically identical with it.[21] On the one hand, we may regard it as of the same essence and nature as the Agent; on the other hand, as in the "specie specialissima" with its Agent.[22] Or, we may combine the two viewpoints, and call it of the same specific essence as its Agent.[23] However we express it, therefore, it differs only numerically from its Agent. In short, the Species of Substance *is* Substance, and of Accident is Accident; and so of Composite and Simple and Matter and Form and Universal and Particular — the Species of each of these *is* just what each is.[24] But with all the identity there is a perplexing difference; and this we consider at once.

It is the *incomplete* effect of the Agent. This is a very essential part of his definition of the Species, but one which Bacon found it difficult to make clear.[25] If, as we have seen, the Species is virtually the Agent, then apparently every Agent will be constantly reproducing its very self. In consequence, all things would be changed into each other; and in the end the "higher" things would replace all others.[26] But things in the world about us show that very few of them reproduce themselves in complete effects. In fact, the higher a thing stands in the scale of being, the less complete is the Species which it produces.[27]

To meet this difficulty our Philosopher finds it characteristic of the Species, that *so long as* it remains Species its being is an incomplete one, and *when* it becomes complete it is simply no longer Species, but the complete Effect.[28] For, the only complete Effect is the Patient-*made*-Agent, the Effect found *after* the operation of the Species; and as opposed to this the Species has not complete being, but is "mere species."[29] That is, it doesn't exist for itself at all, but only for the assimilation of the Patient to the Agent;[30] it is the first effect and produces the complete Effect, but for just this reason it cannot be itself complete.[31] And so one must say, it is really the

20 II—530, cf. C. N. 24.
21 See I—120, cf. C. N. 45.
22 See II—411.
23 Ibid. Cf. 435.
24 For this remarkable conclusion, see II—431.
25 His use of the word is ambiguous; (a) as wanting in the total number of parts in a whole (here applicable to Effect), (b) as wanting in the full character of that which it represents (here Species and Effect).
26 See II—453.
27 See II—413ff., cf. 455ff., C. N. 19, Br. 109. Only the four elementary substances (especially fire) can complete their Species. The four corresponding touch-qualities and light, also can, but color, taste, sound and smell cannot. Cf. infra.
28 See II—414, 419, 519, cf. 413, 416, 424, 503.
29 For "sola species" contrasted with "effectus completus," see II—519, 546, 453, 446, 451 and 57.
30 See C. N. 20. 31 Cf. infra. "first effect."

identical effect which is first called Species and afterwards complete Effect. For, the only difference is that of degree; the kind of difference that exists between embryo and boy, and boy and man.[32]

The *principal* effect. Principal[33] is here opposed to accidental; the Species is the only effect of the Agent's essence, as we have seen, whereas the other effects of the Agent are effects per accidens. The former is produced by the Agent itself, whereas the latter are produced by the Species.[34] The principal effect, once generated, is the means through which all other effects are generated.[35] In part they are effects which perfectly resemble their cause,[36] but for the most part they are not; indeed Nature seeks chiefly the latter.[37] The principal action is that which is straight-ahead, so to speak, and the accidental is rather by the way. While the Agent is at work operating its principal effect through the Species,[38] the Species in turn is sending out its Species in all directions and producing the accidental effects.[39] In sense-perception the accidental as well as the principal propagation of Species is operative.[40] But Bacon is not conscious of the serious implications in this admission.[41]

The *immediate or first* effect. By immediate, or first, effect is meant that effect of the Agent which is produced without the intermediation of any third factor between Agent and Effect. The Species alone is that effect for which such immediacy is demanded; and this is taken simply as an ultimate.[42] But in addition to this primary effect, other or secondary effects are produced; and indeed through the medium of the Species. These mediate or secondary effects are, in the nature of things, further removed from the Agent than the immediate or primary effect.[43] This is obvious, for instance, in the case of light. Its effects are the Species, heat, putrefaction, and death, in the order as they occur in an object deleted. The first is by nature "nearest" the Agent in essence; while the other effects are different in essence from the Agent. For this

32 See II—43, cf. 413, 414. Bacon is not unaware of the inconsistency of this characteristic of the Species with that preceding, and he seeks to solve it. But he is not aware of its significance for his theory of sense-perception and knowledge. Representative knowledge must fall short of certainty in proportion as it represents incompletely (see below, Ch. II).

33 Bacon uses the term as applied to Species seldom (see II—435ff.), but as applied to action and propagation frequently (cf. n. seq.).

34 See II—41ff., 57, 464, 533, I—117, 123, Br. 113.

35 See e. g., II—457, 410, 416, 425, 458, 503, 518, 545, cf. I—111, Br.. 163ff. See also II—43.

36 Species developed into complete effect, as fire from fire. Bacon nowhere specifically says this, but often implicitly. His fusion of Species with complete Effect prevented so sharp a distinction in his own mind.

37 See I—117, Br. 113.

38 See II—457ff., 436. Since species is confused with complete Effect, "principal" must be used for the latter too.

39 See II—505ff., 519, 511, 544. However, the presence of the Agent is necessary, see II—545, cf. 458, 31, I—117.

40 See, e. g., II—44ff.

41 V. inf. Ch. III.

42 See II—435, cf. infra "generation of species."

43 See II—411; "lux-generata-in-medio" is the species, cf. 409, I—216.

reason these secondary effects are called also equivocal.[44] And indeed the distinction is also the same as that between principal and accidental action of the Species.[45]

It is obvious, then, that Bacon seeks to identify the Species with the Agent, in essence and in nature and in operation. But, for all this, they are not numerically identical. For, after all the Species is an effect, with incomplete being, and serves as the medium through which the other effects are produced.

In Relation to Patient and Effect — The Species is just as different from the Patient as the latter is from the Agent; so much is clear from the foregoing. But it is in [46] the Patient and occupies just the space of the Patient.[47] It can do this because of its incomplete being; it is not a body at all.[48] The Species is simply that *through* which the Patient is assimilated to the Agent; and the two remain forever just as opposed as Agent and Patient. More than this one cannot say.[49]

A similar unclearness lurks in the relation of Species to Effect. Since it precedes the Effect, and disappears when once the Effect is produced, it would seem to be different from the Effect.[50] But this is not what Bacon means to say; it is only a question of terms.[51] The " effect " is one and the same, and *numerically the same,* which is at first incomplete and afterwards complete.[52] The species is the " effectus incompletus *vadens* ad effectum completum." [53] It is of the same essence as the complete Effect, and turns into it when the Agent prevails over the Patient.[54] In short, if it is identical with the Agent in all save space and completeness, it is identical with the Effect in every way.[55]

But there is a negative side to his conception of the Species; the reader may also learn, less directly, *what the Species is not.* And since these scattered statements furnish valuable sidelights for his theory, it is important to recount them.

44 With II—411, cf. 414, 530, 457, 410, I—120, cf. sup. n. about equiv. eff.
45 See II—41ff.
46 See, e. g., II—503, 508, 414, 415, 416, Br. 162.
47 See II—502ff. This is puzzling only because the conception of the Species in relation to the Agent makes it appear as a thing emanating from the Agent. Here it is conceived as educed from the Patient. This conflict of the two elements, emission and eduction, will be considered below.
48 Ibid.
49 See II—415ff. where the question is discussed; why not call the Patient-in-process-of-assimilation Species? The answer is, that the complete being determines the denomination. Cf. II—503ff. Bacon could not well be any less clear at this crucial point. For here the emission and eduction conceptions are in conflict. V. inf.
50 That represents one sense of Species; by the other it is part of the effect. Cf. inf. Critique.
51 See II—414, cf. 424 "sortitur."
52 See II—414, cf. 415.
53 See II—503. Cf. Arist. Phys. VIII, 5, 257b, 6; and Metaph. IX, 6, 1048b, 17—which probably suggested this to Bacon.
54 See II—43.
55 The unclearness arises from the very nature of Bacon's problem. Recall, that he is attempting to combine the eduction (Aristotelian) conception with that of emanation (Neo-Platonic).

We are distinctly warned, at the outset, that the Species he treats of is *not* one of the *Universals.*[56] The very word is one rich in its logical associations, and hence the warning is timely.[57] *Nor* is it *Form,* as the opposite of Matter; for these two are found always in span, and so in the Species too.[58] And he interprets Aristotle as never having intended to explain change by reference to Form alone.[59] Further, it is *not a body,*[60] although it may be corporeal [61] — and it may be spiritual too; [62] that depends upon the Agent which produces it. Bacon simply means with this to call attention to the fact, that Species from corporeal objects are not spiritual, and that as corporeal they occupy the space of that in which they exist.[63] Moreover, its action is *not timeless,*[64] since every finite "virtue" requires time to effect anything. But its peculiar character enables it to pass through space far more rapidly than it would if it were an actual body.[65]

There is a final characteristic which may better be considered from its negative aspect. The Species is *not indestructible.* For, having been generated, like other generable things it too is subject to decay.[66] It comes into being quickly, but it also passes quickly away.[67] And hence the need of the continual action of the Agent;[68] which is engaged in producing new Species, the one after the other, to take the place of each as it passes away.[69] As it arose from the Matter of the Patient, it relapses again into this same Matter, in an inconceivably short time.[70] The reasons for its decay are first its inherent weakness (it has an "esse incompletissimum," as we have seen), and second the action of the Patient upon it.[71]

In this last mentioned characteristic of the Species the Neo-Platonic emanation element is so clear, that we may pause a moment to consider it.[72] This conception had come to the later Scholastics through the influence of the Oriental Philosophy, in part reinforced

56 See II—409. The universals also propagate species (II—430ff.).
57 Nevertheless he is not wholly faithful to the distinction. See, e. g., II—413, cf. 43, 546.
58 See II—423, 509.
59 Ibid. The change is produced through the composite, Form *and* Matter. For variety of Matter cf. sup. This is of course not a distinction between accident and substance; for both of these produce species (II—420, 418, cf. 412). We shall see what difficulties this makes for Bacon.
60 See II—504, 546, 72, Br. 112. It is "like a shadow."
61 See II—507, cf. 43.
62 See II—417, cf. III—184, cf. sup. n.
63 His motives are clear, but the consequences are serious, v. inf. critique. Its significance for sense-perception is obvious.
64 See II—525ff., cf. Br. 145ff, 168ff.
65 See II—529. This time-character is involved in its raison d'etre. Cf. II—438, 548.
66 See II—544ff.
67 See II—549.
68 See II—545ff.
69 See II—547ff., cf. 504ff.
70 See II—550, cf. 435. But before passing away it has sent out an indefinite number of species from itself in all directions; among these is the principal species and also the accidental ones.
71 See II—546ff., cf. 439.
72 For the following, see Baeumker: Witelo, Beitraege, III, 2, pp. 358ff. ("Geschichtliche Entwickelung der Lichtmetaphysik").

by that of Augustine. The Jewish philosophers (as Avencebrol) laid stress upon its ontological aspect, while the Arabian philosophers (as Alfarabi and Avicenna) directed their attention more particularly to its dynamic aspect. For Bacon's theory of Species, only the latter conception of this emanation is of significance; the emanation *per virtutem* as opposed to that *per substantiam.*[73] And the influence of Avicenna, elsewhere apparent,[74] may be seen here. The generation and propagation of *Light,* so essential to Avicenna's philosophy, is fundamental for Bacon's theory of Species.[75] Now the details of this process were not worked out by Avicenna;[76] but the fundamental notion of "effluence" is clearly enough indicated. And, what is of significance, his conception attempts to remain faithful to the Aristotelian notion of "eduction." So too with Bacon, as we shall see,there is the clear intention to interpret and not change Aristotle's conception. But in his description of the indestructibility of the Species, as in parts of his definition of it, there has appeared a vacillation between the notion of "eduction" and that of a very sharply defined "emission." This latter could not well have come from Avicenna; and, besides, Bacon directly combats it, as will soon appear. How, then, account for the strong emphasis of this element in his theory of the propagation of Species? I think by reference to Alhazen.[77] For, in Alhazen the notion of emission of the Species is, one may well say, flagrantly ubiquitous. One is able to read his pages only in terms of the actual emission of the Species from the Agent and its inflow into the Patient. With this, then, are given the sources for Bacon's no very simple notion of emanation. It is an eduction conception as attempting to follow Aristotle, probably through Avicenna, and an emission conception as taken from Alhazen.

The foregoing definition of the Species, while perfectly faithful to Bacon I believe, gives in sharper outline than is presented by him the salient and essential features of his conception. In consequence it robs his notion in part of the plausibility which his own pages show. And that is as it should be, provided the presentation is faithful. But, before passing on, let us seek to understand our Author the better, by observing the motives that worked in his mind.

In making the Species the immediate effect of the Agent, immediacy as an unanalysable ultimate is gained for the Species at least. And what is thus gained for the origin of the Species, as one effect,

73 See II—434; cf. 446, for his interpretation of "per virtutem."

74 E. g. I—14, 39, 43, 55, 181, 212, II—11, 13, 15, 27, 50, 54, 55, 235, 241ff., 510. Bacon was acquainted with Avicenna's "Philosophia orientalis," see II—70. A detailed study of Bacon's sources is reserved for a later work.

75 It is the *type* of all propagation, v. II—458ff.

76 Cf. Stoeckl: Gesch. d. Ph. d. Mittelalt., Mainz, 1865, II, pp. 28ff.

77 Died 1038. Known chiefly for his work on Optics (ed. Risner, Basle, 1572). Bacon calls him "auctor certissimimus . . . nec in aliquo fefellit nos in sua scientia." (II—520.)

is gained likewise for the effects which it shall produce. Moreover, the Species can be only an effect of the Agent, and not numerically identical with it; for otherwise the presence of the Species in the Patient would remain to be accounted for. And having essentially an incomplete being, it requires no further account when its work is done. Again, as effect univocal with the Agent, it may be conceived as truly representing and carrying on the work of the Agent. And as principal effect it serves well as a medium between the Agent and those effects which are essentially unlike the Agent. In reference to the Agent, therefore, it satisfies any demands of the emission conception. Finally, it must be even numerically identical with the complete Effect, in order thereby to account for the similarity between this Effect and its Agent; and thus it satisfies the demands of the Aristotelian eduction conception.

One has only to name the motives, to see how in their interplay collision is inevitable. To be sure, an attempt at reconciliation ought to be made; and that shall be done. But, in the meantime, much unnecessary puzzling will be saved the reader, if he will bear in mind, that Bacon is not always clear, because he is frequently ambiguous.

4. GENESIS OF THE SPECIES.

We come now to that aspect of his theory wherein lies the greatest difficulty, as Bacon assures us,[1] namely, the genesis of the Species. The critical examination of this, as of the other aspects of the theory, is reserved for later pages. Our business-in-hand is to get clearly before us that which Bacon meant to say with reference to it. And therefore, even though he does not in the end succeed in presenting his meaning clear of all ambiguities and inconsistencies, it is important that the reader should have in the sharpest possible outline the meaning which Bacon intended to give.

We have seen that the species is an effect of the Agent and therefore so far to be treated as other effects. Now the production of all natural effects is by the way of alteration, or eduction from the active potentiality of the Matter of the Patient; and so it must be in the case of the Species.[2] In order that this may appear as necessarily obvious, Bacon first examines[3] the other suggested ways of its genesis.

The Possible Theories — These may be, by development out of something external to the Agent and the Patient; or through creation out of nothing; or by emission from the Agent; or by way

1 See Br. 108.
2 See II—433, cf. 432, C. N. 19.
3 See II—432ff.

of impression of the Agent on the Patient. Of these the first two are not worthy of consideration.[4] The last might be accepted if taken in the broad sense of transmutation of the Patient through the action of the Agent; it is in this sense that Aristotle uses it as an analogy to explain sense-perception, but the analogy is not an entirely adequate one.[5] As for emission from the Agent, Bacon considers this with some care,[6] but he finds it an impossible explanation. It is impossible, because such an emission from the Agent would involve the total destruction of the Agent. And it is no explanation, because it is the fiction of a third element to explain the production of the Effect — instead of retaining, as it should, the role of effect itself. Proceeding from what is universally granted, namely, that the Agent in contact with the Patient can alter the Patient, the question which this emission theory seeks to answer is this: How can the Agent be in contact with the *depths* of the Patient? And the common reply is: That there are two senses of "contact"; the one is contact by substance, the other is contact by virtue. There is of course no contact by substance, where the depths of the Patient are concerned. But the virtue-contact may serve as an explanation. For, they say, the virtue is given off from the Agent and infused into the depths of the Patient; and in this way the Agent is in real contact with the Patient, through its intermediary, the Species, which is thus instrumental in producing the Effect.

But, says Bacon,[7] while this might seem to explain the production of the Effect, it leaves the production of the Species itself unaccounted for.[8] In other words, it is open to the very objection which it seeks to explain, namely, action at a distance. In point of fact there is no such action. For it would require that the Agent affect the depths of the Patient through a third factor, its "virtue"; but the generation of this "virtutem-in-profundo" requires still a third factor, and that another, and so on ad infinitum.[9] The truth is, that the action is an immediate one throughout.[10]

Other than the above there is no conceivable way for the genesis

4 See II—432, "Hoc enim ridiculum esset."

5 See II—433, cf. 410, 510, 31, cf. Arst. De An. II, 12, 424a 19, de memor. I, 450a, 30. Arist. holds that in sense-perception the Form without the Matter is taken by the senses; cf. Baeumker: d. Arist. Lehre v. d. aeuss. u. inner Sinnesvermoeg. pp. 13ff. Bacon differs from Aristotle in this.

6 See II—432, cf. 434, 435.

7 Ibid. But Bacon himself employs the distinction between "per substantiam" and "per virtutem" (see II—446); but his "influentia per virtutem" differs from the crass emission theory, as we shall see.

8 See II—435.

9 An application of Aristotle's "third man argument."

10 And in the sense that there is nothing between Agent and Patient. Thus, even in the case of the sun's action on things here below, while there is no immediate contact between *substance* of the sun and the earth, the Species makes immediate contact possible. For, the sun alters that part of its orbit in immediate contact with it, and that so altered alters the next, and that the next, until the change is thus "immediately" worked here below. Cf. II—436, 446 with C. N. 20, 24.

of the Species [11] — save one, and that is by eduction from the Matter of the Patient. This is the theory to which Bacon adheres, in reality the Aristotelian notion, and which he seeks to explain. And at this point he means to make an advance beyond Aristotle. Let us see just what he has in mind.

THE EDUCTION THEORY — Having said that immediacy must be taken as ultimate, Bacon can say only, that the Agent comes in contact with the Patient and *forthwith* is produced the effect of the Agent's " virtue " — for that is what this virtue means, the capacity for effecting something. Therefore, in the problem concerning the genesis of the Species, the production as such must remain a mystery. And the only question in point in this: *Whence* is the Species generated? — and " whence " in its definite spatial sense.[12] And Bacon's reply is, that there is only one possible " whence," and that is the Patient itself.[13]

This is obvious from the fact, that the species is identical with the Effect, and to produce the one is to produce the other; [14] but the Effect has the dimensions of that in which it is generated, that is to say the Patient, hence the same must be said with reference to the species, which is the incomplete effect " on its way " to the complete effect.[15] Thus, the species is not put into the receptive potentiality of the matter of the Patient from without, but it comes from [16] the active potentiality of the Patient itself.[17]

But just what is this active potentiality of the Matter of the Patient? We can understand it best in its historical setting, since Bacon means to follow Aristotle in his conception of eduction. For Aristotle [18] there is a twofold notion of Matter. First, of Matter as such, absolute and without Form; second, of Matter as that which with Form constitutes any substance. The former is the " first " or ultimate foundation, which is common to all changing bodies; in itself merely the " indefinite," it is determined through pure Form.[19] The latter is that original corporeal element from which anything arises; it is *the* Matter of any given Composite in which *the* Form may change. This is the Matter of which Aristotle usually speaks. Now in this Matter [20] (as well as in Form) is the ground for the manifold variety of the world about us; for it is merely potential and may become anything. But not everything can

11 See II—433, cf. 437.
12 See II—450, cf. 57, I—111, 138, Br. 120.
13 So Aristotle; see Zeller, ibid. 355, 356.
14 See II—433, cf. 436.
15 See II—503.
16 Bacon's expression is "de potentia," v., e. g. II—433, 436, 437, 458, 503, 508, 509. He also uses "ex potentia," e. g. Br. 230.
17 See II—433.
18 Cf. Baeumker: D. Prob. d. Mat. etc. pp. 240ff.
19 It is of course neither corporeal nor substantial; the conception is dynamic, not spatial. And thus broadly defined, but never systematically employed, by Aristotle, it became the basis for the Scholastic notion of primary Matter.
20 Cf. Baeumker, ibid. 281ff.; Zeller, ibid. 407ff.

become anything; there is a fixed fitness in things. Hence, while the Matter has a receptive potentiality in itself, it has also an active potentiality,[21] which is demanded by this very adaptation of things to each other. It is a cause that co-operates with the formal cause; and it is self-active and resistant. With this, then, is given the distinction between passive and active potentiality of Matter;[22] the Matter not only receives, but it " enables " too.

To return to Bacon. All grant without question, he says,[23] that effects produced in Nature are generated from the active potentiality of Matter, as Aristotle says. And since the Species too is a natural effect of the Agent it is similarly educed. It is impossible that it should come from the receptive potentiality of mere Matter without Form — to which in Creation God as the Giver of Form[24] corresponds. For, in that case we should be forced to speak of all natural generation as a process of continual creation.[25] It is not the Species of " materia prima " that are renewed, but of " materia specifica."[26] For Matter as such is wholly passive, and in no way can it be said to produce Species.[27] But through the action of the Composite and of Form, the Species of the specific Matter is generated;[28] for, the Species is not the likeness of Form or Matter alone, but of the Composite.[29] The Matter here involved is, therefore, that which is connected with some Form; and this Form is replacable, like its " materia propria,"[30] with some new Form and Matter. Or, if you will, it is not merely the Form which is generated, but a new Composite out of new Matter and new Form.[31]

Thus there must be in the Patient an active potentiality corresponding to the active potentiality, or virtue,[32] of the Agent; and which " enables " the Agent to alter the Patient. And it is so that

21 Cf. Baeumker, ibid. 265ff.

22 There is another (the original) distinction between active and passive; namely, the moving- and the material-cause. In this sense the Form, or Agent, is active, the Matter, or Patient, is passive (op. cit. 224). The activity of the Matter differs from that of the Form, in that it is essentially mechanical (it proceeds from the necessity of an inner impulse), whereas that of Form is essentially teleological. In all change, however, Matter and Form go together; the change is from one Composite to another (op. cit. 285).

23 See II—433.

24 A notion which comes from the Arabian philosophy, and of Neo-Platonic origin. See Baeumker, Witelo, Beitr. III, 2, p. 387, n. 1. It is a development of the notion of pure Form corresponding to pure Matter, as indicated in our text. The purely negative aspect of Matter is emphasized by the earlier Arabian philosophers (so Alfarabi and Avicenna, v. Stoeckl, op. cit. 20, 27). Averroes (cf. Stoeckl, op. cit. 67ff. He is less highly estimated than Avicenna by Bacon; thus "homo solidae sapientiae"; I—56, "maximus post eos" (Arist. et Avic.) I—14), who attempts to reconcile Aristotle and Plato, makes fundamental the Substance, which is the subject of all change. Its principles are Matter and Form, the latter immanent in the former; but they are united through an efficient cause working according to pattern. Active and passive potentiality are characteristic of Form and Matter respectively; thus following Aristotle's original distinction. Hence clearly he elaborates rather the notion of primary than of specific Matter. And on this basis he explains the eduction of the Forms from Matter. Bacon, therefore, in his theory of Species, remains more faithful to Aristotle.

25 Bacon subscribes in a sense to this conception. Cf. inf. ch. II.

26 See II—430.

27 See II—426.

28 Ibid.

29 See II—423.

30 The Aristotelian notion that Form belongs to *its* Matter. Cf. II—415, 435, 240.

31 See II—424.

32 Bacon frequently uses "potentia" as convertible with "virtus"; thus, e. g., II—452, 458, 486, 424.

he seems to interpret Aristotle's statement, that every Agent is physically acted upon and changed at the moment of acting, and every Patient is physically active.[33] For, this action of the Patient cannot be referred to its resistance alone, but to the fact that it may even change and alter the Agent itself. He seems indeed to think of an actual conflict between Patient and Agent. For, a complete effect of the Agent can be generated in the Patient only when the Agent has a greater potentiality than the Patient has.[34] And we have already seen, that the Species of the Agent subsides into decay through the opposition of the nature-proper of the Patient, as well as through its own inherent weakness.[35] Accordingly the source whence the Species is produced, is not the mere passive potentiality, fitted only to receive, but the active potentiality of the Matter of the Patient; and as such it is competent to assist in the process.[36]

But we have still to look more closely into the process of eduction, to see just what takes place. The Agent acts as a whole and not part by part; its virtue is not something which can be cut into bits in that fashion.[37] But how is it with the Patient out of whose Matter the Species is produced? It is acted upon and changed part by part, says Bacon.[38] And in the following manner. The Agent changes the Patient by contact with it, as is agreed. But this contact cannot effect a real transmutation in the bare surface, and hence it must change some part of the real substance of the Patient. This part is not a *mere surface* but a body, however small, which must have depth to be even conceived as touched or altered. It is clear that, in this way, the Agent truly reaches the depths of at least this first part of the Patient. And this, as he vigorously adds, is "enough for any sound judgment, although it may not satisfy a loose imagination."

By mere contact, therefore, the first part of the Patient has been altered;[39] and that part is *eo ipso* already Effect, although it is called Species because it is only a part of the total Effect to be wrought.[40] But just how much of the Patient has been affected thereby? Very little, indeed. This part possesses quantity, to be sure, and it is as

33 See II—439 and references to Arist. in notes. Cf. Zeller, op. cit. 418, 419. Bacon's interpretation is probably open to serious question.

34 See II—452.

35 See II—544ff.

36 Bacon usually refers simply to "potentia materiae" as the source, thus e. g. II—436, 437, 458, 503, 508, 548. That he means the "materia patientis" and not the Agent is clear from the fact that he seriously considers (II—437, 438) certain cases, e. g. air and shadow, as sources of light; he shows how one can speak of educing light from these!

37 See II—441.

38 See II—442ff., cf. 436.

39 Concerning the exact time when this change takes places, Bacon does not tell us here. But the answer he would give is clear from his consideration of a similar problem elsewhere (see Br. 145ff., cf. I—69). The change is instantaneous for each part; and in the sense that the last moment when the part *ceased* to have the old character, is numerically identical with that when it *acquired* the new one. For that is just what change means; namely, that a thing loses its character *only by* taking on another.

40 So far as size is concerned the whole Effect is there. For, if this part is considered as a whole in itself, and *not* as part of a whole, it may be regarded as serving for the subject of action. See II—443.

large as it can by nature be to receive the action of the Agent; and yet it is imperceptibly minute.[41] In fact, it must be *as small as possible and yet have definite size,* precisely because of "approximation" as a necessary condition for the action. And that is to say, that its furthest extremity must be as little as possible removed from the Agent.[42]

And how is it with the other parts of the Patient? Bacon replies [43] that the part of the Patient which has thus been changed by the immediate contact, the so-called "pars prima," [44] alters the next succeeding part by immediate contact in turn; and this part altered, alters the next succeeding part, and so on until the complete Effect has been produced. And this must be so. For, the Agent itself cannot effect the change in any but the first part; since immediate contact is the necessary condition, and the Agent is in immediate contact with that part only. But the first part is in immediate contact with the second part, and has the Species or virtue of the Agent whereby it can alter the second part of the Patient, and therefore it will alter it. And we must bear in mind that the Species is not there as Form to alter Matter — in which case the form of the first part would alter the Matter of the first part, the Form of the second part the Matter of the second part and so on [45] — but as Matter *and* Form, to alter the second part of the Patient, which is also Matter and Form.[46]

Concerning the genesis of the species we may now summarize as follows. The problem is not to explain the Species' generation

41 See II—436.
42 See II—442.
43 See II—457.
44 Bacon nowhere says clearly, that this "pars prima" *is* the Species. And since this is important for one of the two senses of Species, we must here give in full the deduction of this implication. The Species as immediate effect of the Agent is *in* the Patient—in the sense, that having no dimensions of its own it occupies the space of that *in* which it is. But in what part of the Patient? In that part immediately in contact with the Agent, that is, this so-called "pars prima"—(which, be it noted, may refer to either a) that minimal part of the Patient which *can* be acted upon by the Agent, or b) that part of the total Effect which *has* been assimilated; both a) and b) occupy the same space)—for, as immediate effect of the Agent, it cannot be in a part of the Patient not immediately in contact with the Agent. Is, then, the Species smaller than this "pars prima"? No, for the "pars prima" as such is not divisible into parts, and can accordingly have nothing "in" it which is smaller than itself (II—444). Is it, on the other hand, larger than this "pars prima"? Again no, for the latter could not then be spoken of as having or receiving it (e. g. "habet speciem," "recepit speciem," etc.). It follows, therefore, that the space occupied by the Species is indentically that occupied by the "pars prima." Spatially, then, the two are identical. But, more than this, the "pars prima transmutata" is of the same essence as the Agent, and the Species too is of this same essence. Both, then, are in essence identical. It follows, then, that Species and "pars prima transmutata" are identical.

We must bear in mind, however, that Bacon could not well have stated explicitly what we have thus found implicit. For he would thereby have deprived himself of the two senses of Species (that is *part* of the total Effect, and *representative* of the Agent), which form part and parcel of his attempt to reconcile the eduction and the emission conceptions. And yet it does come to the surface of his mind at times. If the Species is this "pars prima" then the total Effect may be spoken of as an assemblage of Species; and so Bacon says (II—519), "Sed nunc loquor de sola specie et non de effectu completiori, qui fit ex *congregatione multarum specierum.*" And the same idea is contained in his definition of the Species as "effectus incompletus vadens ad effectum completum" (503). So, too, he says (415), there cannot be two first effects identical in essence and different in number. And, finally, the successive parts changed are said to be the same in quantity (457).
45 See II—443.
46 See II—423.

as such; for that, as an immediate effect of the Agent, remains an ultimate datum. The problem is: Whence does the Species come? And there is only one possible reply; the Species comes from the active potentiality of the Matter of the Patient. This active potentiality of the Patient corresponds to and co-operates with the active potentiality of the Agent; and is thus contributory to the process. The Agent acts as a whole; the Patient is affected part by part. The first part of the Patient is made Species or effect by mere contact with the Agent; but this part has depth, and accordingly the Patient is so far altered "within." This first part having been altered into a Species or effect of the Agent, acts upon the next part to change it in turn into a Species or effect. And so on successively until the complete Effect is produced.

5. LIMITATION OF ITS ACTIVITY.

As a last consideration, in the presentation of our Author's theory, we must take up the question concerning the limitations of the activity of the Species. And we have here to inquire, first, whether there are some things which cannot produce this immediate effect, or Species; and, second, whether this effect once produced can always be developed into a complete Effect?

In Bacon's discussion [1] of this first question, it might seem that really all things produce Species.[2] But this is not unqualifiedly true; a limitation is fixed by a certain fact. And this fact is that the "materia prima" is essentially passive, and therefore cannot generate Species. It is always the Species of "materia specifica" that are renewed.[3] There is no other limitation than this; but we must see just what it signifies.[4]

What Bacon means by "materia prima" as opposed to "materia specifica" we have already seen. But he elsewhere [5] takes up this discussion in full detail,[6] and shows how there is a "genus generalissimum" [7] for Matter as well as for Form and for their Composite. This is pure Matter as opposed to pure Form; "materia prima" as opposed to "forma prima." It is this which constitutes the common basis for the natural and the spiritual worlds.[8] The differences

1 See II—418 to 430.

2 Thus, accidents and substances do; and these exhaust the sum-total of all that is (II—412). And this is true not only of the natural world, but of the spiritual too (I—111), and everything is either natural or spiritual (cf. inf. ch. II).

3 See II—425ff.

4 Its special significance for the theory of sense-perception will be considered below in ch. III.

5 See C. N. 51ff.

6 Which is not demanded for the present exposition.

7 Cf. Br. 129.

8 Cf. II—453. In reply to the question: Where does Matter begin to be "natural," i. e. what is the common basis for all natural action (see II—452, 454, 503, Br. 107, 128), he replies, the "substantia corporea non coelestis" (Br. 129, cf. C. N. 55ff.). In this sense too one can speak of Matter as one (contrary to his general position that it is multiple); and in one sense of Matter (cf. C. N. 60ff.), this is primary Matter.

characteristic of Matter, as of Form, as we find it, are due to specific differences added to the essence of this "materia prima."[9] In the process of "promotion" out of the remote "genus generalissimum" *down* the scale to the "species[10] specialissima," a real difference in Matter, corresponding to that in Form, is required. This is the passage from the incomplete to the complete, which are essentially the same according to Aristotle.[11] And the passage is from the "materia prima" to the "materia specifica.";[12] Matter having its genera and species, just as Form and the Composite have.[13] Now in the process of generation with which Bacon is dealing, Matter and Form are found always together, and Matter seeks its appropriate Form; and since that Form is always imperfect, its Matter will be always seeking a new one.[14] Hence, in all generation, a new Matter as well as a new Form is generated; where there is a renewal of the one, there is a renewal of the other.[15] But this represents change of the "materia specifica," not change of the "materia prima." For this is essentially passive, and therefore not capable of generation.

We see, therefore, that the production of Species is limited to "materia specifica." Let us now see what is involved in saying, that "materia prima" cannot produce them. It means, in short, that the generation of Species is limited to substances and the proper qualities. For, "materia prima" is found to have certain inherent "properties"; in the sense that these precede all generation and follow it and remain always the same.[16] These would include not only bulk and figure and size,[17] but the rare and the dense,[18] and in fact all of the common qualities.[19] As properties of that which is essentially inactive, these can obviously not produce Species.[20] Thus, no Species are produced by common qualities. But everything else produces them. And we may now generalize by saying that everything produces Species save primary Matter and its properties.[21] Or, what is the same thing, the generation of Species is limited to

9 See C. N. 57ff.
10 In the original logical sense.
11 See C. N. 59, cf. Arist. Metaphys. Bk. VIII, Ch. 14; Bk. IX, Ch. 15.
12 Ibid.
13 See C. N. 60.
14 See C. N. 70ff.
15 As Bacon prefers to put it: the species of Matter as well as of Form is renewed or reproduced, though *first and foremost* it is a reproducing of the Species of the Composite, of Form *and* Matter (II—424).
16 See II—427. Bacon is rather loose here—as he is apt to be when pressing a point. For, he takes "materia prima" for primary "materia naturalis" (cf. sup.). But his language (cf. inf.) is too clear to admit of doubt as to what he means to say.
17 See II—430, cf. 427, I—152.
18 See II—517, cf. 426.
19 See II—427. Bacon sometimes says *all*, again *most*, of these. Cf. inf. ch. IV, where it is considered in reference to his theory of Knowledge.
20 He rests this too upon an appeal to experience (426), just as he does to prove that proper qualities do produce Species (418). He says elsewhere (II—76ff), in considering the problem especially with reference to vision, that it is a difficult one. He concludes, however, that only light and color produce Species. All other qualities affecting vision, are either quantity or properties of quantity, which belongs to Matter and is therefore not active.
21 Cf. II—496.

proper qualities [22] and to substances.[23] And, it should be added, not only are they able to do so, but they are doing so continually.[24]

With this then we have given the limitation of the production of the Species. It is produced by all things save Matter and its properties; and its activity is confined to the production of qualitative change as opposed to change in size or change in position. But the question as to what things are adapted to complete their Species, when once produced, requires a few words.

It is to be observed that this question does not strictly concern the Species as such; for Bacon means the Species to be essentially incomplete. It is a question affecting rather the completion of the Effect. But because this conception of complete as opposed to incomplete was one with which Bacon was inclined to play fast and loose, it is especially desirable that we should have his meaning clear. In its phase as applied to the Species we have already presented it; we shall here view it in its phase as touching the Effect.

In his effort to present the conception of the Species which he has in mind, the example which he most frequently employs is that of an Agent which is actually able to complete its effect.[25] And the term Species derives its whole meaning from the fact that there is a *stage* where the effect is an incomplete one. In the cases, then, where there is no stage at which it becomes complete, by reference to what does the Species acquire meaning? By reference to the Agent with which it is identical in essence; and in which case it is an incomplete reproduction of the Agent.[26] And hence it is that we find him speaking in some cases of the effects, and in other cases of the Species, as being completed.[27] Let us therefore see in what cases the Species, or effect, remains incomplete.

We have his own summary reply to this question. The " nobler " Agents, he says,[28] do not complete their Species, such for example as angels, the Heavens, men and other animate objects; nor do inanimate objects, in so far as they are compounded from the elements. Because everything would then generate a complete individual exactly like itself, which would result in the elimination of the various orders of being as we find them. Moreover, there are certain Agents, such as color, odor, taste, and sound, which are of a kind too " weak " to complete the Species which they produce. In fact, only light and the four touch-qualities (heat and cold, dry-

22 Light and color, taste, smell, touch and sound. He remains uncertain, however, concerning sound (see II—418, cf. 456, cf. inf. ch. II).
23 See II—419ff. The sense-organs do (424), and Universals too (430). The significance of this will be considered below in ch. III and IV.
24 See II—516, cf. 31. He also includes "anima rationalis" (I—396ff).
25 That is, Fire, see II—414ff.
26 The two senses will be considered in the Critique.
27 E. g. II—414, 450, 453.
28 See II—446 to 456, cf. Br. 109.

ness and wetness)— and of course the four corresponding elements — are able to complete their Species.[29] But this requires some explanation.

It all hangs together with his conception of the universe as a fixed and orderly whole;[30] and here broadly he follows Aristotle, as elaborated by the Arabians. On the one hand, generation and decay are complementary factors in the constitution of the universe; for, if there were only the ingenerable and the incorruptible parts of it, we should have only the spheres of the elements, the Heavens and spiritual substances, and all the rest would be lacking — which would be indeed a disagreeable pass (quod inconveniens esset).[31] On the other hand, if all substances could complete their Species, the entire order of things as we have it would be destroyed; for the Heavenly bodies are incomparably "nobler" than the terrestrial bodies, and spiritual substance than corporeal substance, and if there were a completion of the Species throughout, the lower order would be absorbed into the higher, and these in turn into the highest.[32] But the purpose of just the process of assimilation of everything to everything else in the universe, through the Species, is to preserve and perfect the parts of the universe, and the universe as a whole[33] And, indeed, for this end is designed the very debilitation and deletion of the Species itself.[34] In short, the "nobler" the substances are, such as the Heavenly bodies and man and the like, the less complete is the mode of being of the Species which they produce; nay more, the Species in these cases is such that it never can be completed.[35]

And so it is, he says,[36] that we have the arrangement of the universe as it is. It is spherical in form, so that from all parts of this sphere the virtues of the Heavens may flow together into the centre of this sphere, which is the "place of generation." And this is none other than the earth, which is the place of compounding and of generation and decay. And therefore the higher parts, such as the Heavenly bodies, are not subject to generation and decay in the order of the universe, because it is their part to continue these processes in things here below. And they in turn are moved by

29 See II—455ff., cf. 57ff. The bearing of this on the theory of perception is obvious, and will be considered in Ch. IV. Light (lux) is a quality of body, and illumination (lumen) is generated from this (II—409). A Neo-Platonic distinction.

30 Cf. sup. Introd.

31 See II—450.

32 See II—453.

33 See II—518, cf. 410, 432, and also 447, 454, 492, 494.

34 See II—545, cf. I—117.

35 See II—413. It should be added that Bacon admitted the "aptitude" of completing their species even in all such cases; for the two conditions of producing a complete effect are here present (II—452ff). But the fact remains that were this aptitude made a reality instead of being kept an impossibility as it is (453), or in other words were this "special dispensation" (ex ordinatione divina) under the universal order removed, then would man be robbed of many things which are necessary to him, and for man all other things exist (453). And so the dictum that all things generable are subject to decay, is to be limited to those things actually existing as subject to decay in the world (454).

36 See II—450.

beings that have Will and which are therefore not subject to decay, that is, Intelligences.[37]

Accordingly it is only on the earth that the Species are completed at all; and here only in the case of the four elements, or elemental qualities, and of light. All other action is limited to the production of Species that remain incomplete. But this really is the nature of the Species, that it should remain incomplete, and therefore it is to be expected that in very few cases [38] Agents should be able to complete their species, that is, actually reproduce themselves.

We are now able to summarize with reference to the limitations of the activity of the Species, and the field of application of the theory. Within the field of the phenomena of qualitative change the theory of the propagation of species is universally valid; in so far as the change is really qualitative, we find no exception where this propagation is not valid. All substances are able to produce Species, and are continually doing so. But in the case of Accidents this is only partly true; all of the proper qualities, but none of the common qualities, are able to do so. Among those things which thus actually produce Species, there is further limitation in the carrying of these to complete Effects. Only light and the four primary elements — or better the quality of light and the four elemental qualities — produce Species which can be really completed.

6. CRITIQUE.

Let us take it as our task, in this critical examination of our Author's theory, to see whether he has said what he intended, clear of all ambiguities and contradictions,[1] and whether his theory thus elaborated permits of the applications which he intended. And here it is important that we bear in mind the circumstances of his composition; for, this will enable us to place a fairer estimate upon his theory, truly great though it was, than he himself could do. It is part of a " Persuasio," a splendid attempt to gain the ear of the Pope *for future work;* his eye was fixed on the " Scriptum

37 This action through Species, holds not only for the influence of the Heavens upon the Earth (446), but also for the mutual influence of the celestial bodies upon each other (446, 447) and even of things here below upon the Heavenly bodies (447ff.). The Neo-Platonic influence upon his interpretation of Aristotle is here very apparent.

38 See especially II—455.

1 Bacon of course is guilty of many such. E. g., cf. II—423 with 424; 442 with 539ff.; 458 with 441; 447 with 414; 413 with 456; 517 with 518; 423 with 431; and 436 with I—144ff., Br. 121ff. But their consideration is not an object of particular importance. They are important, of course, in so far as they indicate how far our Author has worked out details, as distinguished from broad outline; and in so far as they get the shadows as well as the lights of his theory sharply outlined. He is an unusually clear and vigorous thinker, but writing as he did it would be easy to fall into inconsistencies or ambiguities. We know that it was his habit to write and rewrite (Ep. 501). But the exigencies of his exposition demanded that he should *persuade* as well as exposit; and he had to avoid letting any words fall dead from his pen. And, further, he was writing under the strain of shortness of time, lack of material, and unsympathetic surveillance.

Principale," wherein all things should be set in their final and finished form.

If we consider, moreover, the motives which played upon our Author's mind, we see at once that the task which he had set himself was no light one. He must remain true to the dynamic conception of the Species; and yet the very concept which he is using, and seeking to make clear, was rich in its logical associations. Primary matter is accepted as inactive in its very nature; and yet from the potentiality of the Matter of the Patient the Species is to come — and, further, the Species of Matter as well as of Form must be educed, to account for the variety in the latter as well as in the former. The separate orders in the universe, especially as to body and spirit, must be kept distinct and wholly apart from each other; and yet the interaction of the one upon the other must be explained. The process of assimilation demands that *in* the Patient shall arise the *likeness of the Agent;* and yet nothing shall come *from* the Agent. The raison d'etre of the Species is intermediation; and yet he must not fail to retain the nature of mediacy as an unanalyzable ultimate. With such motives playing upon his mind, and more often subtly than sharply, one may expect him to be not always wholly aware of the full implications of all that he says.

And now let us make plain for ourselves some of the important implications of the various elements of his theory, that we may the better see how inevitable the ambiguities were. Let it be observed at once that if the Species is *an* effect of the Agent, it is only one of many effects which the Agent may produce. Strictly, then, it should not be used to explain the *production* of these other effects. And while the production of effects univocal with the Agent may be made intelligible, by reference to the eduction theory, care must be exercised in trying to explain *in the same way* the production of the equivocal effects.

If the Species is the univocal effect of the Agent, it is the *one* effect which is of the same essence with the Agent; the other effects are *eo ipso* not. But, these other effects constitute the vast majority of the effects actually produced. Hence most effects are not like the Agent in essence; and that is to say, they have become assimilated without having been made essentially like. So, assimilation is possible at least without complete likeness between Agent and Patient. But this is inconsistent with the conception of the Species as identical with the "pars prima." Accordingly, some other conception of the Species is before his mind; namely, that of a representative of the Agent through which the other effects are brought into being. Again, if it is the uniform effect of the Agent, the *difference* in the several effects produced cannot be due to the

Species but is due to the difference in the Matters of the Patients. Hence, in several Patients whose Matters differ, the " pars prima " as part of each Patient will differ from the " pars prima " of the several other Patients. But the " pars prima assimilata," if uniformly Species, in each case must be identical in essence. Now the total Effect is a summation of such parts; accordingly the total Effect should be identical in essence in the several cases — if the Species is the " pars prima." But the Species as " pars prima " is essential to his eduction theory. Therefore, here again some other notion is before his mind, namely, the emission theory.

If the Species is not mere Form, but Form and Matter inevitably in span, then change cannot be effected through Form alone; the Matter has also its part to play. So, then, the Species, as " pars prima assimilata " of the Patient, is both Form and Matter. But the Species is educed from the *Matter* of the Patient; and that is to say, that the only change in the Matter consists in its acquisition of a new *Form.* Here then again are two different conceptions of the Species. In the one case it is Matter *and* Form; in the other case it is *mere* Form. Only as a true representative of the Agent is it the former; whereas it is the latter alone when considered as a means of educing the change in the Matter. A conflict once more between the emission theory and that of eduction. Further, if the Species is the incomplete effect of the Agent, it will be lacking quantitativly or qualitatively in its likeness to the Agent. The latter it cannot be, for it is univocal with the Agent. And the former it can be only as a weak or a small reproduction of the Agent. And if its character of incompleteness is measured by reference to the complete effect, it is incomplete as part of a whole. It may therefore be conceived as an incomplete reproduction or an incomplete whole; and the two are readily confused. The first is consistent only with the emission theory, and the latter with the eduction theory alone.

If the Species is the immediate effect of the Agent, it is not brought into being through the medium of a third factor. Its mode of production is therefore an unanalysable ultimate. And as thus immediately produced in the Patient, it must be identical with the " pars prima." It follows, then, that a full assemblage of Species is the " effectus completus," and that fewer than this assemblage is an " effectus incompletus." Hence, complete as opposed to incomplete means here more as opposed to less; it signifies the relation of whole to part. This is consistent with his eduction theory alone. Moreover, if the Species is identical with the complete Effect, it must be qualitatively, not quantitatively, so. For, the one is an incomplete part of the whole, and the other is the complete

whole. So, the Species itself, as *part* of the whole, is in one sense not incomplete; it is the Effect which is incomplete, or complete. Here, then, again appears the double conception of Species as reproduction and as part of the whole.

And, finally, if the Species of body is corporeal, and the Species of spirit is spiritual, it must remain always in essence that which its Agent is. As an intermediary, therefore, between two wholly different and separate worlds, it can never serve to change the one into the other. Hence there can never be an assimilation of the one world to the other *through the Species.* And so, this character of the Species is consistent with neither the eduction theory nor the emission theory; strictly, it represents a fixed parallelism. And we may expect its abandonment when any interaction between the two realms is involved.

The foregoing serves well to make obvious the ambiguities to which our Author was liable, and also wherein these ambiguities lie. To ask now whether he presented his meaning clear of all ambiguities is therefore idle. It is plain that he could not do so. For he is seeking to combine, *in full detail,* the Aristotelian theory of eduction with the emission theory received through Arabian influence. One may ask: What theory did he succeed in presenting with clearness and force? And the reply can be given in a few words. In the first part of his treatise he presents an eduction theory of Species, and with admirable success, all things considered. But for most of the rest of his work it is a modified emission theory which is before his mind's eye. And he was led to entertain extravagant hopes for his much-prized theory through a very serious shortcoming. He failed to sufficiently clarify for himself certain architectonic concepts. And the better to see compactly the inconsistency of his presentation, we may pass to these at once.

Most important of all, we may note that he makes use of two very different notions of " incomplete." In the one sense it means wanting in the total number of parts, as a part of a whole; and in this sense it is strictly applicable only to the Effect as such. In the other sense, it means wanting in the full character of that which produces it, as a representative of its principal; in this sense it is strictly applicable only to the Species. But because Bacon thought of the Species as identical with the Effect, he was enabled to pass from the one sense to the other, as best suited the convenience of exposition. This allowed him to think of the Effect, on the one hand, as the whole whose parts were the Species. In which case the raison d'etre of the Species was to indicate the *gradual* character of the production of the change. And this forms the essence of

his eduction theory. On the other hand, he thinks of it as a reproduction of the Agent, without possessing in full the character of the Agent. In which character its raison d'etre is that of *representation.* Here the incomplete effect is identical with the Species. And so it is applicable in his modified emission theory. Or, to put it briefly, it allowed him to think of the Species at the same time as that which is essentially definable by reference to the Effect, and also as the incomplete reproduction of the Agent.

But this is not the only concept which Bacon failed to get outlined for himself without uncertain associations. The concept of " potentia " suffered a similar fate. Thus, he takes it at the outset of his treatise as that which is essentially identical with the " virtus " of that in which it is, differing from this " virtus " only in aspect.[2] Where then that aspect is lost for the moment, the identity becomes a complete one, and so the mere potentiality of the *Matter* of the Patient becomes a virtue of the Patient as *Matter and Form.* It is thus that he is able to think readily of the " potentia " in the matter of the Patient as also active; so making the Matter to have something more than a merely passive character. And in this sense the Matter of the Patient has an active potentiality; here " potentia " is convertible with " virtus." But, in its other sense, of mere possibility, it is wholly inactive and only potentially that which is about to act upon it. At a point so subtle and intricate we need not wonder that he fell short of greater clearness. And yet to omit to be clear, was serious for his theory. For on this point his advance over Aristotle in the largest measure turned. He definitely seeks to explain, *in detail* be it remembered, the conception of eduction from the potentiality of the Matter of the Patient. And in part he succeeds. But he falls short of consistency in just this critical conception of the meaning of potentiality. The identical Matter cannot readily be conceived as passive and active at the same time. But if it is not the identical Matter, the change as affecting *that part* is no better explained with than without reference to Matter. Aristotle is also unclear at this point; but Bacon in aiming to elaborate upon his master proves hardly less so.

And the shortcoming is the more vital for Bacon, because he seeks to explain the production of equivocal effects precisely by reference to the *Matter* of the various objects acted upon. He makes intelligible the production of like out of like, by the detailed explanation in which Species is taken as " pars prima " of the Patient. But how like can produce unlike, or something *essentially* different, he wholly fails to say. And yet these, the equivocal effects, are the ones found for the most part in Nature. He seems

2 See II—408.

to take it for granted that the Species of Species, being inherently weak, must produce effects which differ essentially from the Species' Agent. And he probably thought that the reactive activity of the Patient's Matter might therefore the more readily help in producing an effect essentially different from the Agent. But precisely how light can produce fire, and so putrefaction and so death *or* life,[2a] he wholly fails to say. And possibly his unclearness concerning the Matter made this omission necessary.

Finally, Bacon's notion of the Species as composite, consisting of inseparable Matter and Form, was one which he did not frame with such clearness as to enable him consistently to avoid the notion that Form is the intermediary through which the change is effected. For we find him slipping into this notion on the very pages where he is seeking to prove the opposite; the notion, namely, that the phenomenon of change is to be explained by the simple dictum of Form as the *means* through which the Agent assimilates the Patient to itself.[3] On the one hand, he is found developing the idea that all effects come from the action of the Agent on the Patient; and in the sense that all the effects are the product of Form (the Form of the Agent) from Matter (the Matter of the Patient). But the Matter of the Agent remains, and the Matter of the Patient must remain too *if* the Form is *being produced* from *it*. Here his necessary condition of a matter common to both is in point.[4] The Form of the Agent remains but is duplicated in the Patient; the Form of the Patient disappears — back into the Matter of the Patient from which it originally arose.[5] *The only change here is change in the form of the Patient.* On the other hand, he develops the idea that there must be diversity in the Matter of the Patient as well as in its Form. Here the virtue of the Agent is not only Form but Matter as well. The Species is the effect; the effect is the *new thing* resulting, and as such it must be both Form and Matter. In this sense the Effect is identical with the Agent. *Here then there is change in Form and change in Matter* of the Patient.[6]

In the one case the Species is conceived of as the Form (of the Agent) whose correlate is Matter (of the Patient); here the Species cannot change *its* Matter but the Matter of another. In the other case it is a Composite, made up of Form and Matter, and as such can do that which its Principal, the Agent, could do if it were actually present. He is therefore here repeating what he later does

2a The effects of Light are, Species ("lux-generata-in-medio"), Heat, Putrefaction, Death (II—411, cf. 457, 530, I—120); but it may also generate *Life* (Br. 115). Heat generates Heat, Putrefaction (C. N. 24, II—43, I—120) *and Dryness* (II—43). Rarefaction also generates Heat (I—168)! Just how all this is brought about, we are nowhere told.

3 See II—423 and 424.

4 See II—452.

5 See II—435ff., cf. 544ff.

6 See II—438.

in the case of the soul;[7] under one aspect it is taken to be pure Form, under another it is taken to be composed of true Form and true Matter.

One may wonder, how Bacon could have allowed himself to be so confused. But the real wonder would be, that he had avoided doing so. For, he is seeking to combine the Aristotelian conception of change "through true eduction and assimilation," that is through the action of the Form on the Matter, with the conception of the indissolubility of Form and Matter and the variety in Matter as well as in Form. It was therefore the most natural thing for him to think of the virtue of the Agent in one instant as Form, and in the next as Form and Matter. The Agent as such was Form, and the Patient as such was Matter; but the Agent as a thing possessing virtue was composite, its virtue was therefore composite, and made up of Form and Matter — and the same would be true of the Patient as thing. Thus it is that the Patient may be conceived of as active and the Agent as passive, during the very act of assimilation. Had he actually made a synthesis of these two conceptions of the species, that of it as Form alone and that of it as Form and Matter, how different reading Bacon would present to us.

With, then, three such important concepts as the foregoing not sharply defined in his mind, we see how Bacon could have been guilty of the inconsistencies which are to be found in his presentation. It is therefore not our task to make Bacon consistently state the pure eduction theory; we have already sought to do this and found it impossible. It is rather our task to make plain that he was not able to work himself loose from the emission theory; and accordingly to seek to make him state some form of a modified emission theory, which may possibly be stated with clearness and consistency.

The general problem which is before Bacon's mind is this: How can an Agent, in part or as a whole at a distance from the Patient, produce *in the Patient* an Effect like itself? And first we may take those cases where the Agent and the Patient, each an object with a particular essence, are in immediate contact at their surfaces. Through immediate contact, and without the intermediation of a third element, the Patient is to be made like the Agent; that is to say, the change in its essence is made, or the new Effect comes into being. But how can one speak of immediate contact between the whole of the Agent and the whole of the Patient, when obviously the only contact at hand is that of the surfaces of the two? By recourse to the notion of the Species, as the means through which the effect in the *depths* of the Patient is worked. Not, be it said at once, that the Species is something which is given off *from* the

[7] Cf. inf. ch. II.

Agent, to pass *to* the Patient in its deeper parts. But that the Patient is affected part by part, and the Species are these parts effected. And in the following manner.

The Agent must be taken to act as a whole, and not part by part; there is therefore no question as to how the depths of the Agent can be and are as effective as the surface in their action upon the Patient. But the Patient is affected [8] part by part; the first part which is affected being that minimal *part,* and hence having depth in a real sense, in immediate contact with the Agent. This part is effected immediately and without the intervention of any intermediary between the Agent and the Patient. As yet therefore we have no intermediation. But the first part effected is *eo ipso* the Species of the Agent; and as Species it is the first and univocal effect of the virtue of the Agent and with full powers to do the work of the Agent were it in its place. This Species, or first part effected, then acts upon the next part of the Patient with which it is in immediate contact; and this is thereby effected as the first part was effected by the immediate contact of the Agent. There is still then no intermediation; the action as such is always immediate. To be sure, it is no longer the Agent itself which is performing the change in each of the parts succeeding the first part; *but for this very reason* it is unfair to speak of mediacy — the Species is acting for the Agent just because it and not the Agent is in immediate contact with the respective parts. Each part successively is therefore changed by that effected part, or Species, which precedes it. And when they have all been effected we have the complete Effect, as similar to the Agent which produced it, as were the Species similar to their Agent.

It is plain then that the sort of mediation which seems here to appear is to be distinguished from *inter*-mediation. For, the Species in the foregoing is not conceived as something which acts *between* the Agent and the Patient; it is rather that which acts *as* the Agent. It is not something which is given off from the Agent to pass over to the Patient and there do its work. It is already in the Patient and called out by immediate contact of the Agent with the Patient, and when it is called out it is already the effect of the Agent. If the action were cut off sharply at that moment, to give us a cross-section as it were, there would be no longer Agent set over against Patient, but Agent set over against Effect. For the Species is the effect of the Agent, and incomplete only in the sense that it is but a part of the total Effect. But this is for those cases in which the Species is carried to a complete effect; in most cases it remains incomplete. A somewhat different conception of the Species is

8 I use "affected" to refer to the general process of assimilation, and "effected" for the finished action, as to the part involved.

therefore necessary. The Species must be thought of in relation rather to its Agent than to the Effect.

And here it is that the notion of the Species as a small or a weak reproduction of the Agent, characterized by incompleteness of being, is necessary to make the presentation clear. It is identical with its Agent in all saving this character of its being; and differs from it only as a boy, for example, differs from the man. But lacking only in that respect it can stand for its principal and that which the Principal would do were it actually present. But is this the Species which is educed from the Matter of the Patient? It is not — in the essential conception of that Species. For, the force of Bacon's description of that Species lies, line by line and proof by proof, in its incompleteness as defined *by reference to* the complete Effect. But is there not some sense in which this Species too may be conceived as educed from the Matter of the Patient? There seems to be; even though we have no clearly detailed statement of Bacon's for it. And it is this. The Agent acts as a whole and the Patient is affected part by part, as before. The Species is again the incomplete effect of the Agent; but the effect here is incomplete by reference to the Agent, not incomplete by reference to the complete Effect. It is the representative of its Principal the Agent, and there will therefore never be any "completer effect." The Patient is to be conceived here as not only changed part by part, but each part is only partly changed. And in this case, if we take a cross section at some given instant, the Agent will not stand over against a complete Effect, but over against an incomplete Effect — an Effect which is a small or a weak reproduction of itself.

This, however, is in point only when the Agent is in immediate contact with the Patient. But what shall we say for those cases in which the Agent and the Patient are as far removed as the Sun and the Earth? Simply, that while the Sun could not itself act, it could do so through its virtue or Species. And in this manner. The medium between the Sun and the Earth will have been assimilated; for that medium's "first part" will have been in direct contact with the Sun and accordingly altered by this immediate contact. This first part will have altered the second part, and the second part the next succeeding part and so on up to that part which is in immediate contact with the Patient. And for just the same reason that the first part was able to alter the second part, the second the next succeeding part and so on, for just that same reason by immediate contact this last part will be able to alter the Patient — and the reason is, that so far as efficiency is concerned this part *is* the Sun; the virtue of the Sun is actually there. The first part of the Patient is altered by the last part of the medium, to speak exactly, and

the process goes on in the Patient as before. That the Sun has not through its Species produced in the medium so striking an effect as it will produce in the Earth, is due only to the fact that the medium was not so adapted to receive and develop these Species.[9] Indeed, if it is a Star instead of the Earth, the effect will be yet more striking; it will be a complete and full effect, and without the deletion of the specific nature of the Star.[10]

This then is conceivably the manner in which the Species in the second sense, as we have found it, might be educed even from the Matter of the Patient. Would it then seem odd that Bacon does not more fully state it in this form? It would not seem so if we consider that Bacon's eduction theory covers, strictly taken, only those cases in which the Agent and the Patient are in immediate contact; this was obviously his own intention, as his pages show. And further, that in particular it was more easy to conceive of the Agent acting as a whole when in immediate contact with the Patient — and being so near therefore the more forcefully — than when so far removed as is the Sun from the Earth, for example. For such cases he was forced to fall back upon a modified emission theory.[11]

And in saying that he still virtually held to the emission theory, it is obvious from the foregoing that his was a purged and refined emission theory. To be sure, he often falls, in his description, into the crude terms in which the emission theory was wont to be couched; and indeed the latter half of his treatise is bristling, at first sight, with terms which suggest an actual emission of the ray from the Agent. But that for Bacon these cruder connotations were absent, is plain from the fact that the background of his whole thought as touching the matter was deeply imbued with his eduction theory. And we have seen that the whole permits of a formulation which may be broadly, even if not strictly, spoken of as the eduction theory — or, better, the emission theory as modified by the eduction theory.

But is there not some plain explanation as to how the emission theory, even in this less crude form, could have rested in his mind side by side with his eduction theory? Fortunately for us, he unwittingly furnishes us with this explanation. It is at that point where he has completed his exposition of the eduction theory; and he is about to pass to the consideration of the laws of the propagation of the Species, as illustrated by the rays or Species of light. And he says:[12] From the same point, whether taken as the minimal part of the Agent in breadth and depth, or from the first part of the Pa-

9 See II—519ff.
10 See II—414, cf. 518, 520.
11 As applied to the theory of perception, we shall see (ch. III) that Species pass from the eye to the Heavens as well as from the Heavens to the eye.
12 See II—458ff., cf. Br. 167.

tient more properly speaking, the Species are propagated like rays, infinite in number as it were. However, this irradiation of the Species from the Agent-part is not in such wise that it goes out from this part, but rather, as stated, it comes from the potentiality of the Patient — and yet too from the virtue and active potentiality of the Agent-part itself. The Agent is like a common point from which lines infinite in number are sent in every direction, and over which lines the Species are propagated like rays. And yet more properly speaking, it is the first part of the Patient which is this point, because as a matter of fact the first origin of the Species is wholly in the first part of the Patient, from whence it is poured out on all sides and in every direction. And so we may speak in this way. The first part of the Patient is like a common centre for an infinite number of lines and rays, and yet a terminus to which they are continued. While the part of the Agent is the centre and terminus at which they touch.

Here he had the problem clearly before his mind: the "place" of the generation of the Species. This "place" is in the Agent, and yet the Species is educed from the Patient — and so more properly speaking the place of generation is in the Patient. And his mind rests secure here in the face of possible inconsistency, because he keeps that one picture before it, for which his statements hold true — the picture of the Agent and the Patient *in actual contact.* And it is this picture which enables him to lightly make the transition.[13] Within a few pages following he has abandoned this picture and is speaking of the rays which pass along these same lines, but *from* the Agent *to* the Patient. The Agent and the Patient are no longer in contact, and between the two a pyramidal cone is conceived to be the sphere within which the action takes place; or rather, there is an indefinite number of cones, whose common base is the Agent, and whose cones are at the surface of the Patient — and the Species originate at the Agent and pass to the Patient. Bacon does not harmonize the two conceptions. But we have already seen how, under a modified emission theory, he may have vaguely felt that there was no inherent contradiction between the two.

In conclusion, it remains for us to inquire, Could Bacon have applied the theory as he intended to do? And a few words will suffice for the reply. In his works as we have them it cannot be said that he had worked out more than the broad outlines of the theory — except in Optics, where following Alhazen he speaks in terms of the emission theory. Accordingly we do not know just how he thought of the applications in detail. But there are indica-

[13] Only a few pages preceding (450) his mind has been occupied with a very different picture.

tions that he had given his attention far less to these details than he had to the broad sketching of the theory; and also there is inherent in the theory that element of parallelism which would really have made impossible the interaction which he conceived. Let us make this clear by reference to certain examples.

For the mutual influence of the Earth and the Heavenly bodies, we have seen that it was not really the eduction theory which was applicable, but the emission theory in its refined form. In so far then as he meant the eduction theory of Species to be applied to this mutual influence, what he intended was not possible. And further he has here left obscure a most important point, in spite of the fact that he again and again gives us evidence of his intention of applying the theory in this field. Namely, the influence of the Heavens in producing life and in affecting character.[14] If this theory is to hold at all here, it must be by the modified emission theory and not by the eduction theory of generation. The Sun, for example, has a generative heat but also a vital heat as well; and so its life-giving Species would generate life. But the life-giving element in the sun is not life, but heat; and no explanation lies in the combination of "generativam et vitalem" to account for the production of life out of heat. And in the case of the human being, the human soul of the parent is also auxiliary in producing this life. Here, then, is an important instance where his failure to explain the equivocal effects is serious. Further, how can a hot and dry sun so act upon man as to produce good character instead of bad, or a man of affairs rather than a student? Bacon can reply only generally in these terms: The air about us is filled with the virtues of the Sun, and this air as assimilated to the Sun acts upon our physical bodies and changes them. In turn the body acts upon the soul and changes it. And so men are made to wish what they had not wanted to wish, and not to desire what they had previously desired. Here then the corporeal Species has in so far as it is the *bona fide* factor in the process of assimilation, become somehow spiritual. A parallelism has passed over into an interactionism, as it were.[15]

Or, to take the reverse of this. He tells us that Nature obeys the thoughts of the mind.[16] And in such wise that the willing of a certain corporeal effect will produce that effect. And, to take the case only of the sensitive soul, he cites the instance, as given by Avicenna,[17] of a fighting cock which though victorious had lost its

14 Cf. inf. ch. II.

15 It is needless to say that the mediaeval philosopher would not easily be aware of any such contradiction. For, the Aristotelian philosophy presupposes a genus generalissimum common to corporeal and spiritual; and following this the theory of intermediaries formed a part of the background of thought. But Bacon shows so clear a perception (cf. inf. ch. II) of the distinction between body and spirit as to remind us much of the Cartesian distinction. It is therefore the less to be expected in him.

16 See I—396ff.

17 See I—402.

spurs in the fight, and from the very pride of victory (which of course carried with it the idea of the possession of large spurs) forthwith grew new spurs. And he shows us how novel the thought was to him, by further quoting that hot and cold come not from hot and cold in the external world, but from the mere thought of the mind; and so it is that sickness arises, and every change in the body of any given soul! This odd transition from the one world into the other, with a kind of abandoned license, makes it plain that the ideas were novel to him, and that he had not thought out the details in their consequences. Again, it is the same difficulty of interaction between two wholly different worlds.

And we have this same unclarified difficulty with reference to the action of the Angels in producing the movements of the Heavens. For, the Angels are purely spiritual Intelligences, and motion is a concept which has meaning only in the purely corporeal world. The Angels cannot be spoken of as moving from place to place; and as little should they be spoken of as moving something else, that is some corporeal thing, from place to place.

The difficulty meets us then again and again. But even where this difficulty is not present, it would seem evident that Bacon had not considered with care the details of the application of his theory. To take the case of infection.[18] He speaks of the *vapors* and the *spirits* and the *Species* coming from persons, all as though they were fused in his mind into one and the same thing. As such he conceives of them as passing from one individual to another. And again,[19] he conceives of these same vicious Species, when they come from venomous reptiles, as capable of being reflected by mirrors in the same way that rays of light are reflected by mirrors; with mathematical skill they can be directed at will, to work injury, for example, in an enemy's camp.

It is plain then that there remained for the application of his theory the difficulty of interaction; and that with the details of the application of his theory he was less concerned than with the fixing of its outlines. By confining himself to certain clear mental images, he was enabled to think with force and consistency within certain limits. But beyond these limits his theory was fluid and indefinite. But to have actually risen to so lofty and bold a conception, broad and general though it be, was an extraordinary accomplishment for a thinker of the thirteenth century. And one who seeks to fill in the details which Bacon failed to work out, comes to realize full well what wealth of patient and clear and profound thought our philosopher spent on his structure. In the chapters that follow we shall consider in fuller detail certain applications of this interesting theory.

18 See I—398, cf. 142. 19 See Br. 585.

LEBENSLAUF.

Geboren bin ich, Horace Craig Longwell, am 22ten Mai 1876, zu Santa Fe, New Mexico, Vereinigten Staaten von Nord Amerika, als Sohn des Arztes Robert Hamilton Longwell und seiner Gemahlin Elizabeth geb. Kenney. Bis zum fuenfzehnten Jahr besuchte ich die Privat-Schule in Santa Fe, dann vier Jahre lang die "Occidental Preparatory School" in Los Angeles, California. Den "College Course" legte ich in den Jahren 1894 bis 1898 an der "Stanford University" zu Palo Alto, California, und der "University of Pennsylvania" in Philadelphia, Pennsylvania, zurueck, und beschloss denselben im Jahr 1898 mit dem Bacalaureates Exam. Nach einjaehriger Unterbrechung bezog ich im Jahre 1899, zum Zweck des Studiums der Philosophie, die Universitaets-Abtheilung der "University of Pennsylvania," und im Jahr 1902 die "Harvard University," zu Cambridge, Massachusetts, an welcher ich bis Juli 1904 verblieb. Im Jahre 1905 reiste ich nach Deutschland um hier meine philosophischen Studien weiter zu fuehren und daneben mich in anderen Wissensgebieten umzusehen. Ich verbrachte zwei Semester in Muenchen, das Winter-Semester 1906-07 in Strassburg, dann wieder zwei Semester in Muenchen, von wo ich Oster 1908 wieder nach Strassburg zurueckkehrte.

Vorlesungen und Uebungen besuchte ich bei folgenden Professoren und Dozenten:

Philadelphia,—bei den Herren Fullerton, Newbold, Singer und Witmer.

Cambridge,—bei den Herren James, Miller, Palmer, Royce und Santayana.

Muenchen,—bei den Herren Brentano, Cornelius, Doeberl, Furtwaengler, Heigel, Hellman, von Hertling, Jansen, Lipps, v. Mayr, Poehlmann, Preuss, Schneider, und Simonsfeld.

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